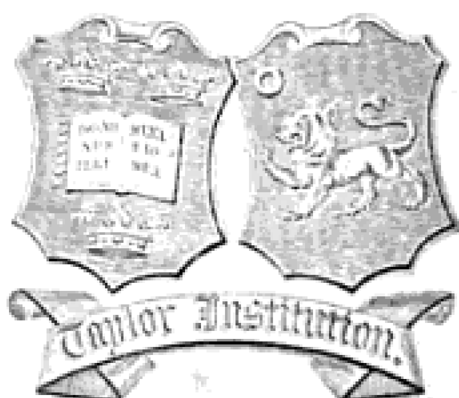

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ON

ANCIENT HINDU ASTRONOMY AND CHRONOLOGY.

BY

MAX MÜLLER, M.A.

CORRESPONDANT DE L'INSTITUT DE FRANCE, &c.

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(Preface to the fourth volume of the Rig-veda.)

SINCE the publication of the third volume of this edition of the Rig-veda, the age and authenticity of the sacred writings of the Brahmans have become the subject of new and animated discussions, and many points in the history of the ancient literature of India which seemed almost beyond the reach of reasonable criticism, have become overcast by doubts and surmises. Although it would be impossible to examine every objection that has been raised, there are some which deserve a careful consideration; and I feel that it becomes part of the duty incumbent on me, as the editor of the Rig-veda, to state how far the convictions which I expressed on former occasions as to the age and character of the Vedic literature in its four divisions, the Chhandas, Mantra, Bráhmaṇa, and Sútra periods, have been either changed or strengthened by the researches and arguments of other scholars.

The first question which requires to be considered anew is,

Can the age of the Vedic hymns be fixed by astronomical evidence?

In my "History of Ancient Sanskrit Literature" I have endeavoured to show that it is possible to distinguish four great classes of literary compositions, corresponding to four great periods in the growth of the Vedic religion and of the theological system of the Brahmans. The most recent of these four periods extends to about 200 B.C., and from the peculiar style in which all the works belonging to it are composed, it has received the name of the *Sútra period*. Several of the most eminent among the authors of Sútras or aphorisms lived prior, if not to the origin, at least to the spreading and the political ascendancy of Buddhism, and hence the date 600 B.C. was assigned as the most probable for the beginning of the Sútra period.

It is, I believe, admitted by all scholars, that the Sútras presuppose the existence of the Bráhmaṇas, another class of Vedic writings, which together

constitute what I call the *Bráhmaṇa period*. As that period comprehends the first establishment of the elaborate Brahmanical ceremonial with its four classes of priests, the composition of separate theological treatises, the so-called Bráhmaṇas*, their collection, and again the schism of sects which were founded originally on the basis of the great collective Bráhmaṇas, it would seem impossible to bring the whole of this literary and theological activity within a narrower space than 200 years. I therefore assigned to it a duration from 800 to 600 B. C.

The Bráhmaṇas, again, presuppose the existence of a complete collection of Vedic hymns, such as we now possess in the ten books of the Rig-veda Sanhitá. Seven out of these ten books belonged originally to separate families or clans, and each contains a number of hymns, clearly the productions of different generations of poets. Some of these hymns are written in imitation of others, and the more modern assume a decidedly ritual character. As Mantra is the technical name of a hymn employed for sacrificial purposes, I have designated the period during which the latest sacrificial hymns were written, and collected, together with the older hymns, at first into separate books, and afterwards into a complete body of sacred and liturgical poetry, the *Mantra period*. Several generations of modern poets, and probably two classes of collectors, have to be accommodated in it; so that if we allow 200 years to this period, this is hardly out of proportion to the work which had to be performed in it.

* I differ from Professor Westergaard (Abhandlungen, p. 57), and still prefer to derive bráhmaṇa from brahmán, 'the priest,' not from bráhman, which is said to have the sense of "the holy element in the sacrifice." (Roth, Nirukta, p. XXVI.) My reasons are,

1. It is not correct to form a derivative like bráhmaṇa from a neuter, bráhman, in the sense of treating of or concerned with the bráhman. We should not find a work, treating of náman or sáman, called námana or sámana; at least I know of no analogous formation in classical Sanskrit. It would certainly be against Páṇini, for Páṇini allows the suffix añ only after words which have not the udátta on the first syllable. (IV. 2, 44.) He would allow bráhmaṇa to be formed from brahmán, 'priest,' but not from bráhman, 'prayer.'

2. Bráhman does not occur, at least in ancient works, in the sense of "the holy element in the sacrifice;" it means 'prayers,' 'offerings.' In later works it is used for Veda or holy word, &c.

3. The Bráhmaṇas treat chiefly of the outward ceremonial, the karman. They give the vidhis, 'rules,' or the kalpa, 'ceremonial,' together with the arthavádas, 'comments.' The bráhman is treated of in the Áraṇyakas and Upanishads, which constitute the brahmakáṇḍa, as opposed to the karmakáṇḍa.

4. The Bráhmaṇas contain just that kind of information which the Brahmáns, as overseers at sacrifices, would want, nay, without which they could hardly have exercised that ministerial function which was peculiarly their own.

There remains the last and most important period in the history of Vedic literature, that of the ancient poets or Rishis, who, by their songs, gave the first impulse to the religion, the poetry, the worship of the Aryan dwellers in India. Their forefathers were strangers in the land of the Seven Rivers, and some of the thoughts and accents of the earliest Vedic hymns may point beyond the natural frontiers of the great Indian peninsula. To assign any definite date to the first or the last of the old Rishis is clearly impossible; yet looking at the numerous relics of that early age, I ventured to suggest 200 years as a minimum, which few, acquainted with the early history of mankind, could consider extravagant. I thus arrived at about 1200 B.C. as the latest date at which we may suppose the Vedic bards settled in the Northern regions of the Indian continent. I pointed out repeatedly, that beyond the frontiers of the Sútra period (600—200 B.C.) our chronological measurements must necessarily be of a merely hypothetical character; yet I felt convinced that those who from an intimate acquaintance with the Vedic literature are most competent to form an opinion as to the time required for its growth, its maturity, and its decay, would allow that the minimum durations assigned by me to the Bráhmaṇa, Mantra, and Chhandas periods were below rather than above the average durations of similar periods in the intellectual and literary history of other nations. I may be allowed to quote the concluding words of my History of Ancient Sanskrit Literature, as I find they have given rise to a curious misunderstanding. "The chronological limits," I said, "assigned to the Sútra and Bráhmaṇa periods will seem to most Sanskrit scholars too narrow rather than too wide, and if we assign but 200 years to the Mantra period, from 800 to 1000 B.C., and an equal number to the Chhandas period, from 1000 to 1200 B.C., we can do so only under the supposition that, during the early periods of history, the growth of the human mind was more luxuriant than in later times, and that the layers of thought were formed less slowly in the primary than in the tertiary ages of the world."

I should have thought that the meaning of this paragraph could hardly have been misapprehended, and that the expression "layers of thought," was sufficient to show that the terms "primary and tertiary ages of the world," could not refer to geological periods and to the growth of the crust of the earth, but were used metaphorically of the periods in the historical growth

of the human mind. I was not prepared therefore for a question addressed to me rather bluntly by a distinguished philosopher. "Is 1200 B.C. a primary age of the world except in Biblical geology?"—a question to my mind entirely meaningless, unless we ascribe to it a meaning unworthy of so intelligent and liberal-minded a writer.

With this single exception, however, my anticipations of the judgment of all competent scholars with regard to the minimum durations assigned by me to the four periods of Vedic literature have not been deceived. On a question so purely hypothetical as the chronological system on which my History of Ancient Sanskrit Literature was built, the assenting votes of independent and fair-minded scholars are, of course, of great importance, and I shall therefore quote the opinions of some who have a right to be heard on these difficult problems. Professor Wilson, in his Review of my History*, says:

"Professor Müller thinks it impossible to assign a shorter interval than two centuries for the origin and accumulation of the mass of Brahmanical literature that must have existed. We confess that we are disposed to look upon this limit as much too brief for the establishment of an elaborate ritual, for the appropriation of all spiritual authority by the Brahmans, for the distinction of races or the institution of caste, and for the mysticism and speculation of the Áraṇyakas or Upanishads: a period of five centuries would not seem to be too protracted for such a complete remodelling of the primitive system and its wide dissemination through all those parts of India where the Brahmans have spread. There seems no reason to question the general accuracy of the lists of teachers preserved by Brahmanical tradition, and which, as Professor Müller remarks, would extend the limits of this age to a very considerable degree. These traditions are preserved in different supplementary works or Vanśas, also regarded as Bráhmaṇas, several of which are extant. There are several of these in the Śatapatha-bráhmaṇa, which Professor Müller quotes, and he concludes that from their extent it is possible that the limit he suggests will have to be extended. We quite concur in this anticipation, and think there can be little doubt that, instead of two centuries, we may venture to conjecture four or five, and so carry the commencement of the Bráhmaṇa period to the tenth or eleventh century B.C."

* Edinburgh Review, 1860, p. 375.

The same scholar, after stating his reasons for treating the Mantra and Chhandas periods as one "complete in itself, though extending over a long space of time, and in some instances to a very remote antiquity," hints at the twelfth to the twentieth centuries B. C. as the probable limits of the age which gave birth to the poetry of the Veda.

M.Barthélemy Saint-Hilaire*, in his articles on the same work (January, p. 53), has the following remarks as to the approximative durations assigned by me to the four periods of Vedic literature: "Ces considérations m'amènent naturellement à la dernière question que je voulais traiter, en rendant compte de l'ouvrage de M. Max Müller, et que j'ai déjà plus d'une fois indiquée; c'est celle de la chronologie. L'auteur ne pouvait guère se borner à diviser l'histoire de l'ancienne littérature Sanscrite dans les quatre périodes distinctes que nous avons successivement parcourues avec lui; il devait aussi tenter d'assigner à chacune de ces périodes une durée approximative. Mais c'est là qu'est le péril, quand on songe à quelles incertitudes est encore livrée presque toute la chronologie indienne, et de quelles ténèbres elle est couverte. Cependant, en s'appuyant sur quelques données générales, qui sont actuellement admises par les indianistes, et dont j'ai parlé plus haut, M. Max Müller établit que les quatre périodes répondent aux dates suivantes; la période des Soûtras, qui dure quatre siècles s'étend en remontant de l'an 200 avant J. C. à l'an 600; celle des Bráhmaṇas comprend de l'an 600 à l'an 800; celle des Mantras, de l'an 800 à l'an 1000; et enfin la période du Tchhandas va de l'an 1000 à l'an 1200 avant l'ère chrétienne. Il est bien entendu que ce ne sont là que des à peu près, et, malgré l'apparente rigueur de ces chiffres, il est clair qu'on ne peut arriver en ceci à aucune détermination précise. Aussi M. Max Müller aurait-il peut-être bien fait de ne pas chercher à fixer des limites aussi arrêtées et de ne pas circonscrire si nettement les choses. Comme il y a nécessairement toujours beaucoup de vague dans les appréciations de ce genre, il est bon que la forme donnée à des hypothèses soit indécise elle-même autant que les assertions; et, comme il n'y a rien de moins flexible qu'un nombre une fois qu'il est énoncé, il eût mieux valu, je crois, rester dans une demi-obscurité, qui est, d'ailleurs, bien excusable en ces matières. Tout le monde reconnaîtra, du reste, que les supputations de M. Max Müller sont très-modérées, et, s'il a failli en quelque chose, c'est plutôt par un excès de réserve. La durée de chacune de ces périodes est bien courte; et, comme les

* Journal des Savants, August, September, October, December, 1860, and January 1861.

Samhitás, telles que nous les possédons, sont rédigées un millier d'années au moins avant notre ère, on peut faire remonter sans la moindre crainte la période du Tchhandas fort au delà, et l'on en revient ainsi aux calculs de Sir William Jones et de Colebrooke, qui reportaient la composition du Rig-Véda à quatorze ou quinze cents ans avant J. C.

"D'un autre côté, cette durée uniforme de deux siècles donnée à la période des Bráhmaṇas, comme à celle des Mantras et du Tchhandas peut également prêter à la critique. Si la période des Soûtras a pu remplir quatre siècles entiers, il paraît peu probable que celle des Bráhmaṇas, qui sont beaucoup plus longs et tout aussi nombreux peut-être, n'en ait pas remplit davantage, en y comprenant les Áraṇyakas et les Oupanishads. Il y a certainement aussi beaucoup moins de distance entre les Bráhmaṇas et les Soûtras, qu'il n'y en a entre les Mantras et les Bráhmaṇas. Cependant M. Max Müller ne compte que deux siècles entre chacune de ces deux classes. L'analogie semblerait autoriser à mettre bien plus d'intervalle entre les unes qu'entre les autres. Il y a une immense différence entre l'époque ou l'on constitue les recueils de la poésie sacrée et l'époque ou on les commente; il y en a moins entre cette dernière et celle où l'on réduit ces commentaires diffus et obscurs à des règles claires et méthodiques. Quant à la période des Mantras, elle semble, de son côté, trop développée, si celle des Bráhmaṇas ne l'est point assez. En admettant qu'il ait fallu deux siècles pour la composition des Bráhmaṇas, la simple collection des Samhitás n'a pas dû en exiger autant. Ainsi donc, sans contester la durée absolue des périodes réunies, leur durée relative ne paraît pas très-acceptable, et cette proportion pourrait être établie d'une manière toute différente, qui se justifierait non moins bien. Quant à la période du Tchhandas, la première de toutes, et la plus féconde puisqu'elle a enfanté tout le reste, il est bien à présumer qu'elle à été la plus longue; et cette inspiration, qui a vivifié, durant plus de trois mille ans, toute la croyance réligieuse d'un grand peuple, n'a pas pu être passagère pour que ses effets aient été si durables. Mais je quitte le champ des conjectures, et je m'empresse de résumer cette analyse que j'ai faite avec tant de détails, et tant de satisfaction du livre de M. Max Müller."

Like Professor Wilson and M. Barthélemy Saint-Hilaire, Professor Whitney too, the learned editor of the Atharva-veda and of the Súrya-siddhánta, has expressed his conviction that the chronological limits assigned by me to the four periods of Vedic literature are too narrow rather than too wide.

"We may next follow Professor Müller," he writes, "in his attempt to establish a chronological groundwork for the Vedic literature. How extremely delicate and difficult a task this is wont to be in matters affecting the literary history of India, is sufficiently known to all who have had any occasion to deal with the subject. What wild and baseless theories respecting the dates of events, and the periods of works, or classes of works, in Hindu antiquity, have been built up and accepted, only to be overthrown again and forgotten! But also what learned and cautious conclusions upon like subjects have been drawn by critical scholars, to be proved fallacious and set aside by farther research! It can scarcely be said that there is a single Sanskrit work, not of quite modern authorship, in existence, whatever be its prominence and importance, over the period of which there reigns not an uncertainty to be measured only by centuries. The one reliable date which we possess for Indian history, until times long posterior to the Christian era, is furnished by the Greek accounts of the Indian sovereign 'Sandrocottus,' contemporary of the early successors of Alexander. That this is the king called by the Hindus Chandragupta, the founder of a new dynasty upon the Ganges, there can be no reasonable doubt; luckily, the prominence of his grandson, Aśoka, in Buddhist history, as the Constantine of Buddhism, the first who gave that religion supremacy in India, has led to the preservation of such trustworthy accounts of him as permit the satisfactory identification of the two personages. This datum is well styled by our author the sheet-anchor of Indian chronology; without it we should be, even respecting the most important eras of Indian history, drifting almost hopelessly at sea. If there has been, besides this, any date in which nearly all students of Hindu archæology have acquiesced, agreeing to regard it as satisfactorily established, it has been that of the death of Buddha, as supposed to be fixed by the Buddhists of Ceylon, at B. C. 543. But, in the work now under consideration, Professor Müller attacks with powerful arguments the authenticity and credibility of this date also: he points out that the Ceylon data, if compared with and corrected by the Greek era of Chandragupta, indicate rather 477 than 543 B. C. as Buddha's death-year; and he argues farther, that the data themselves contain an artificial and arbitrary element which destroys their faith; and that back of the great synod under Aśoka, about 250 B. C., we really know nothing of the chronology of Buddhism. From this conclusion

we do not ourselves feel inclined to dissent; the considerations adduced by Müller as the ground of his scepticism are not easily to be set aside; and we have been taught, by long and sad experience, that a Hindu date is not a thing that one can clutch and hold. But while we pay our author homage in his character of Siva, the Destroyer, we cannot show him equal reverence when he acts the part of Brahma, the Constructor; for the basis of evidence on which he founds his system of chronology for the Vedic literature seems to us far less substantial than that which had been relied upon to establish the date of Buddha's entrance upon nihility. Let us briefly review his reasonings. He begins with laying down as strongly as possible the marked distinctness of the periods represented by the three principal classes of the Vedic literature, showing that each class necessarily presupposes the existence and full development of that which precedes it: as regards the two later classes, he dwells upon the native distinction of them as *śruti* and *smṛiti*, 'revelation' and 'tradition,' respectively, contending that this implies a recognition of the latter as of notably later origin than the other. He farther divides the period of the Hymns into two, that of their composition and that of their collection and arrangement: the former he styles the *chhandas* period, the period of spontaneous poetic productiveness; the latter is the *mantra* period, that in which this poetry had become invested with a conventional and adscititious character,—had become *mantra*, 'sacred formula.' To such a division no Vedic scholar will refuse assent; the wide difference, in time and in character, between the singers and the diaskeuasts of the hymns has long been recognised, and has only failed to be marked by a suitable and happy nomenclature; that proposed by our author will probably henceforth be generally adopted. Professor Müller thus establishes four chronological steps, or separate and successive epochs of time; and, save that we may regard it as still uncertain how far these periods have interlaced with, or even slightly overlapped one another, we find nothing in his method to criticise."

Professor Whitney then proceeds to state some objections to the dates commonly assigned to Páṇini and Kátyáyana, and he continues (p. 263): "Adopting 600—200 B.C. as the period of the *sûtra* literature, our author assumes that each of the two which preceded it may have lasted for a couple of centuries, and accordingly suggests as the epoch of the composition of the

Vedic Hymns the time prior to 1000 B.C.; or, if to it be assigned the same length as to the two succeeding epochs, 1200—1000 B.C. To this date for the beginnings of Hindu history and culture no one will deny at least the merit of extreme modesty and caution: it stands in this respect in most refreshing contrast with the theorizings of many others who have had occasion to treat the same point. The era of the Vedic poets is more likely to have preceded, perhaps considerably, the time thus allotted to it, than to have been more modern.....It is, upon the whole, clear that a final positive determination of the controversy, if ever attained, must be arrived at, not by following any one clew, however faithfully and perseveringly, but by carefully combining all evidences, whether literary, historical, astronomical, or of whatever other character they may be. Professor Müller can by no means be blamed for adhering to the general methods of his work, and refraining from entering upon those other lines of inquiry; but we should have been better satisfied if he had guarded against misapprehension by at least referring to their existence, and their indispensableness to the full solution of his problem."

I need hardly say that I agree with almost every word of my critics. I have repeatedly dwelt on the merely hypothetical character of the dates which I ventured to assign to the first three periods of Vedic literature. All I have claimed for them has been that they are minimum dates, and that the literary productions of each period which either still exist or which formerly existed, could hardly be accounted for within shorter limits of time than those suggested. Like most Sanskrit scholars, I feel that 200 years, or about six generations, are scarcely sufficient to account for the growth of the poetry and religion ascribed to the Chhandas period. There are vistas opened to those who are able to appreciate the perspective distances of thought which seem to reach to a much more remote past. But unless such general impressions can be clearly defined, so as to force conviction even from the prejudiced and the unwilling, it is worse than useless to express them at all. Nothing has brought Oriental studies into greater disrepute than the constant attempts of enthusiastic scholars to claim an exorbitant antiquity for the primitive civilisation of the East; and the equally unreasonable scepticism which rejects all history previous to 500 B.C. as fable or forgery, is but a natural reaction called forth by the over-confident assertions of the students of Egyptian, Babylonian, and Indian antiquities.

It has been pointed out, however, that although on the evidence of literature alone, no higher antiquity could have been claimed for the earliest poetry of India than the thirteenth century B. C., I ought to have strengthened my argument by additional evidence, and particularly by that of certain astronomical data which have long been brought forward as establishing the existence of Vedic poetry as early as the fifteenth century B. C. My reasons for not entering upon a discussion of these astronomical questions in a history of Sanskrit Literature have been rightly guessed by Professor Whitney. My object was to show how far the literary productions of the Vedic age could by themselves be made to bear witness to the antiquity of the Vedic religion and poetry. I was writing a history of Vedic Literature, not of Indian Astronomy. Nor could I have supposed that my not alluding to the trite arguments of Bentley, Colebrooke, Laplace, and Biot on the chronological meaning of certain astronomical observations preserved in certain Vedic treatises, could be so far misinterpreted as to expose me to the charge of either disregard for ignoring, or ignorance for disregarding the theories of those eminent scholars and astronomers. That I was not ignorant of their researches, I had shown by what I wrote in 1846, when first announcing my intention of publishing an edition of the Rig-veda. "With regard to the antiquity of the Veda," I then said, "the most striking remark is that of Colebrooke, bearing on an astronomical observation of the position of the colures. That observation is to be found in a small treatise appended to the Veda, which, partly by its position as a Vedánga or member of the Veda, partly by its general style, belongs to an earlier period than the great scientific astronomical works of Varáha Mihira, Brahmagupta, and others. These astronomers refer to that observation as one of earlier date, and we may well believe in its reality if we bear in mind that the Brahmans themselves never make use of it as a proof of the high antiquity of their sacred literature, nay, that they could not have done so, because, if used for chronological purposes, the date derived from that astronomical notice would stand in direct contradiction to their own system of chronology. Brahmagupta *,

* "En effet, Brahmagupta n'a pas eu l'avantage d'être un personage mythologique. On sait qu'il a existé très-réellement vers la fin du VI^e ou au commencement du VII^e siècle de notre ère, et qu'il appartenait au collège d'Oojein, célèbre alors dans l'Inde comme un centre de science astronomique." Biot, Journal des Savants, 1859. Etudes sur l'Astronomie Indienne, p. 31. Colebrooke (Misc. Essays, II, p. 463) established the date of Brahmagupta by the following process: "The star

who lived at the end of the sixth and the beginning of the seventh centuries, as proved by the position of the colures at his time, and who knew the observation of the earlier position of the colures, declares against the admission of a precession of the equinoctial points; and although other astronomers admitted a precession or vibration *, yet they, too, were not in possession of sufficient observations to prove, still less to utilise for chronological purposes, a regular periodical precession of the equinoctial points. This is an argument which, as it reaches back to the fourteenth century B. C., may be used with advantage against those critics who cannot be convinced of the antiquity of any work except by figures and dates."

Chitrá, which unquestionably is Spica Virginis, was referred by Brahmagupta to the 103rd degree counted from its origin to the intersection of the star's circle of declination; whence the star's right ascension is deduced 182° 45′. Its actual right ascension in A. D. 1800 was 198° 40′ 2″. The difference, 15° 55′ 2″ is the quantity by which the beginning of the first zodiacal asterism and lunar mansion, Aśviní, as inferrible from the position of the star Chitrá, has receded from the equinox: and it indicates the lapse of 1216 years (to A. D. 1800) since that point coincided with the equinox; the annual precession of the star being reckoned at 47″, 14. The star Revatí, which appears to be ζ Piscium, had no longitude, according to the same author, being situated precisely at the close of the asterism and commencement of the following one, Aśviní, without latitude or declination, exactly in the equinoctial point. Its actual right ascension in 1800 was 15° 49′ 15″. This, which is the quantity by which the origin of the Indian ecliptic, as inferrible from the position of the star Revatí, has receded from the equinox, indicates a period of 1221 years elapsed to the end of the eighteenth century; the annual precession of that star being 46″, 63. The mean of the two is 1218½ years; which, taken from 1800, leaves 581 or 582 of the Christian era. Brahmagupta, then, appears to have observed and written towards the close of the sixth or the beginning of the following century; for, as the Hindu astronomers seem not to have been very accurate observers, the belief of his having lived and published in the seventh century, about A. D. 628, which answers to 550 Saka, the date assigned to him by the astronomers of Ujjayiní, is not inconsistent with the position, that the vernal equinox did not sensibly to his view deviate from the beginning of Aries or Mesha, as determined by him from the star Revatí (ζ Piscium), which he places at that point." Biot (Journ. des Sav., 1845, p. 41) gives 572 as corresponding to the equinox of ζ Piscium.

* "L'autre notion que Colebrooke présentait encore comme propre aux Hindoux, c'était le mouvement de trépidation périodique attribuée par eux aux points équinoxiaux et solsticiaux de l'orbe solaire. Retrouvant plus tard cette idée dans Albategui et chez les Arabes d'Espagne, il la croyait dérivée des astronomes Hindoux par les communications qui s'établirent entre eux et les Arabes de Bagdad au temps du calife Almanzor." (Biot, Journal des Savants, 1845, pp. 383, 385, 447.) "Mais nous voyons aujourd'hui dans les tables manuelles de Théon, que cette idée était pareillement Alexandrine, et les doutes d'Hipparque sur la constance de durée de l'année tropique pourraient faire soupçonner qu'elle avait déjà cours au temps de ce grand observateur, puisqu'un mouvement d'oscillation supposé propre à l'orbe solaire produirait, en effet, des variations correspondantes dans cette durée. Si l'on admet une transmission directe ou indirecte des théories grecques dans l'Inde, comme cela parait impossible à méconnaitre, l'idée de la trépidation, qui en faisait partie, a dû y parvenir en même temps." Biot, l. c.

Though much has been written in the interval on Indian astronomy, and in particular on the possibility of deriving certain chronological dates from the astronomical observations alluded to before, I still adhere in the main to the opinion which I expressed sixteen years ago. But I do not intend to deny that many and very weighty objections may be urged against the use which Bentley and Colebrooke made of these observations, and I doubt whether an appeal even to the authority of a Colebrooke, the greatest of all Sanskrit scholars, is sufficient to silence the opposition of astronomers and historians. It may be as well to state some of these objections in order to warn those who allow themselves to be guided by the authority of even so eminent a scholar and astronomer as Colebrooke, against the dangers which this kind of authoritative belief invariably entails, namely, a tendency to shrink from the trouble of examining all evidence to the contrary, and to speak with greater certainty of the results obtained by independent inquirers than these inquirers themselves have claimed for their discoveries.

The first time that Colebrooke refers to the date of the Vedas is in the year 1801, in the seventh volume of the Asiatic Researches (p. 283), in a note to his article on the Religious Ceremonies of the Hindus, (Miscellaneous Essays, I. 200). In describing the offerings to the manes, Colebrooke mentions a prayer in which the six seasons, the hot, the dewy, the rainy, the flowery, the frosty, and the sultry, are enumerated; and he adds a passage from the Veda, first quoted by Sir W. Jones (As. Res. III. p. 258), in which these six seasons are each identified with what he considers two lunar months. He then argues in the following manner: "According to the Veda, the lunar months Madhu and Mádhava, or Chaitra and Vaiśákha, correspond with Vasanta or the spring. Now the lunar Chaitra, here meant, is the primary lunar month beginning from the conjunction which precedes full moon in or near Chitrá, and ending with the conjunction which follows it. Vaiśákha does in like manner extend from the conjunction which precedes full moon in or near Viśákhá to that which follows it. The five Nakshatras, Hasta, Chitrá, Sváti, Viśákhá, and Anurádhá *, comprise all the asterisms in which

* This statement is based on astronomical considerations, and is quite independent of the statements of later Indian astronomers, such as the author of the Súrya-siddhánta. As long as the Nakshatras are taken in their original sense, as twenty-seven equal divisions of the heavens, two months, or two-twelfths of the year, correspond, not with four, but with four and a half Naksha-

the full moons of Chaitra and Vaiśákha can happen; and these lunar months may therefore fluctuate between the first degree of Uttara-Phalguní and the last of Jyeshṭhá. Consequently the season Vasanta might begin at soonest when the sun was in the middle of Púrva-Bhádrapadá, or it might end at the latest when the sun was in the middle of Mṛigaśiras. It appears, then, that the limits of Vasanta are Pisces and Taurus, that is, Mína and Vṛisha. (This corresponds with a text which I shall forthwith quote from a very ancient Hindu author.) Now, if the place of the equinox did then correspond with the position assigned by Paráśara to the colures, Vasanta might end at the soonest seven or eight days after the equinox, or at latest thirty-eight or thirty-nine days; and on a medium (that is, when the full moon happened in the middle of Chitrá) twenty-two or twenty-three days after the vernal equinox. This agrees exactly with the real course of the seasons; for the rains do generally begin a week before the summer solstice, but their commencement does vary, in different years, about a fortnight on either side of that period. It seems therefore a probable inference, that such was the position of the equinox when the calendar of months and seasons was adjusted as described in this passage of the Veda. Hence I infer the probability, that the Vedas were not arranged in their present form earlier than the fourteenth century before the Christian Era."

It will be clear to every attentive reader, that the object of Colebrooke in these remarks is to protest against the received chronological notions of the Brahmans, who place the Veda at the beginning of the Kali-yuga, 3102 B.C.* He wishes to show that it could not be older than the fourteenth century. This he states distinctly in what follows: "If the Vedas were compiled in India so early as the commencement of the astronomical Kali-yuga, the seasons must have then corresponded with other months; and the passage of the Veda, which shall be forthwith cited, must have disagreed with the natural course of the seasons at the very time it was written." But even if wishing only to fix the earliest possible date of the Veda, Colebrooke has taken many things for

tras. See Weber, Nakshatras, p. 348; and p. 358. I should have thought that Jyeshṭhá would be more likely as the fifth Nakshatra than Hasta; but all depends on the nature of the months, whether synodical or sidereal, a distinction which has been completely overlooked by late writers on this subject.

* Súrya-siddhánta, ed. Burgess and Whitney, p. 29.

granted which would not be granted to him at present. The passage of the Veda on which he builds his conclusion is, as he says, taken from Ápastamba's copy of the Yajur-veda, usually denominated the White Yajush. There is no copy, i. e. no śákhá, of Ápastamba for the White Yajush. But be that as it may, no such passage identifying the twelve months with the six seasons occurs in the Rig-veda; and the Yajur-veda, both the Black and the White, in which such passages* do occur, belong to a secondary period of Vedic literature. This objection, however, applies only against Colebrooke as wishing to prove that the Veda could not be older than the fourteenth century. It is of no importance for our own objects.

But, secondly, the course of the seasons differs in different parts of India, and because in Central India the rains begin generally one week before the summer solstice, we are not at liberty to conclude that it was the same in the North of India, where the hymns of the Veda were composed.

Thirdly, the months and seasons would not at once have changed their names, even though they had ceased to coincide with the time of the year from which their names were originally derived, to say nothing of the different systems of counting time in different parts of India. We know from the Nirnayasindhu (Calcutta, 1833), that South of the Vindhya the lunar month begins with the moon's decrease, whereas in the North it begins with new moon or the moon's increase. It is said in the same work that a Bráhmaṇa begins his month with the new moon or Amávásya, a Kshatriya and Vaiśya with the Sankránti or the entrance of the sun into a new sign. In more ancient times we are told that the number of the seasons varied from three to five and six†, and that different castes began the year with different seasons‡.

Fourthly, the observation of the colures by Paráśara and the calculated date of that observation as 1391 B.C. are taken for granted.

This argument therefore is, as Colebrooke himself has freely acknowledged,

* The earliest passage is Taittiriya-Sanhitá IV. 4, 11, 1. मधुश्च माधवश्च वासंतिकावृतू । शुक्रश्च शुचिश्च ग्रैष्मावृतू । नभश्च नभस्यश्च वार्षिकावृतू । इषश्चोर्जश्च शारदावृतू । सहश्च सहस्यश्च हैमंतिकावृतू । तपश्च तपस्यश्च शैशिरावृतू ॥ For other passages see Boehtlingk and Roth, Sanskrit Dictionary, s. vv.

† Jyotisha-bháshya, p. 5b. पंचर्तवः संवत्सरस्येति च ब्राह्मणं । तथा गर्गः त्रय ऋतव इत्याह कृष्णात्रेयः । षड् गर्गः । ऋतवो द्वादशेति नारदः । चतुर्विंशतिरिति भागुरिः । त्रीणि शतानि सषष्टिरित्याह क्रौष्टुकिः ।.

‡ Jyotisha-bháshya, p. 3b. ननु यद्येवं कथमृतूनां वसंतो जायत ब्राह्मणस्तत्पूर्वाः ऋतव इति उच्यते तास्तु वर्णानां क्रमानुष्ठानाभिधायकत्वेन प्रवृत्ताः ।.

"*vague and conjectural*," and, in the present state of Sanskrit scholarship, it ought no longer to be quoted.

Colebrooke, however, again touched on the same question in the year 1805, in his Essay on the Vedas, in the eighth volume of the Asiatic Researches, p. 471, Misc. Essays, I. p. 108. He had then met with the passage in the Jyotisha, so often quoted afterwards, where the solstitial points are mentioned, as at the beginning of Dhanishṭhá and the middle of Ásleshá, and he maintained that this situation of the cardinal points was true only in the fourteenth century B.C. Here two points have to be considered, 1. the character of the astronomical treatise, the Jyotisha; 2. the astronomical interpretation of the solstitial points as there mentioned.

The Jyotisha may have been written, as Colebrooke says, in the infancy of astronomical knowledge, but that it is later than the Rig-veda, later than the Yajur-veda, later than all the Bráhmaṇas and all the Vedic Sútras, no one would doubt at present*. What Colebrooke meant by infancy of astronomical knowledge, may best be gathered from the following facts. "The Jyotisha is adapted to the comparison of solar and lunar time with the vulgar or civil year. The cycle there employed is a period of five years only. The month is lunar, but at the end, and in the middle, of the quinquennial period, an intercalation is admitted, by doubling one month. Accordingly, the cycle comprises three common lunar years, and two, which contain thirteen lunations each. The year is divided into six seasons; and each month into half months. A complete lunation is measured by thirty lunar days; some of which must of course, in alternate months, be sunk, to make the dates agree with the nycthemera. For this purpose, the sixty-second day appears to be deducted †: and thus the cycle of five years consists of 1860 lunar days, or 1830 nycthemera, subject to a further correction, for the excess of nearly four days above the true sidereal year: but the exact quantity of this correction, and the method of making it, according to this calendar, have not yet been sufficiently investigated to be here stated. The zodiac is divided into twenty-seven asterisms, or signs, the first of which, both in the Jyotisha and the Vedas, is Kṛittiká,

* M. M.'s History of Sanskrit Literature, p. 210 seq.

† "The Athenian year was regulated in a similar manner; but, according to Geminus, it was the sixty-third day which was deducted. Perhaps this Hindu calendar may assist in explaining the Grecian system of lunar months." Colebrooke.

or the Pleiads. The place of the colures, according to these astronomical treatises, will be forthwith mentioned: but none of them hint at a motion of the equinoxes. The measure of a day by thirty hours, and that of an hour by sixty minutes, are explained, and the method of constructing a clepsydra is taught."

From these remarks it is clear, that though in one sense all this may be called the infancy of astronomy, the method of constructing a clepsydra and other scientific processes of a similar character are not exactly what we are prepared for when we speak of a knowledge of the stars and seasons in the fourteenth century B. C. The most important point, however, is this, that the passage which, according to Colebrooke, contains the statement of the solstitial points, such as they were, according to him, in the fourteenth century, does not occur in the Mantras, the age of which is certainly anterior to the tenth century B. C., nor in the Bráhmaṇas, nor in the Sútras, but in a treatise, the Jyotisha, which no scholar would place higher than the third century B. C.* This treatise was written, not for astronomical purposes, but to explain the principles for fixing the hours, days, and seasons of the ancient sacrifices. Even if it had been written but yesterday, the writer would have had to accommodate himself to the primitive ideas on the motions of the heavenly bodies, as prevalent in the liturgical traditions of the Brahmans, just as a scholar who writes on the festivals of the Greeks would have to speak in the primitive astronomical language of Greece, not in that of Copernicus. To make this clear I shall quote the introductory verses of the Jyotisha. The only MS. which I possess is that of the E. I. H. 1510, containing text and commentary. Colebrooke says, that the commentary is the work of an unknown author, and that it is accordingly assigned to a fabulous personage, S'eshanága. This is

* It is curious that no Sútras on astronomy have as yet been discovered. Prose quotations on sacrificial astronomy occur here and there in commentaries, but they seem extracts from Kalpa-sútras or Bráhmaṇas. Thus Somákara quotes Laugákshi as having said: माघ्याः पौर्णमास्याश्चतुरहः पुरस्तात् संवत्सराय दीक्षंते, 'four days before the full moon in Mágha, they sacrifice to the year,' i. e. to the new year. He likewise quotes Garga, sometimes in S'lokas, sometimes in prose; for instance: तथा च गर्गः । तेषां च सर्वेषां नक्षत्राणां कर्मसु कृत्तिकाः प्रथममाचक्षते ।. But these are passages such as occur frequently in Bráhmaṇas and Kalpa-sútras, as when the S'atapathabráhmaṇa and the S'ánkháyana-bráhmaṇa speak of the full moon in Phálguna as the first in the year, (या वैषा फाल्गुनी पौर्णमासी संवत्सरस्य प्रथमा रात्रिः), a passage which shows as clearly as possible that the full moon in Phalguní is meant as the first in the year, not the Phálguna month, whether sidereal or synodical. Professor Weber (Nakshatra, p. 329) takes a different view.

indeed the name of the commentator as given at the end of the book (इति शेषनागकृतं ज्योतिःशास्त्रभाष्यं समाप्तं). But I believe we ought to read, इति शेषनागकृतज्योतिःशास्त्रभाष्यं, so that S'eshanága, sometimes the name of Patanjali, would be the author of the text, whereas the commentary was composed by Somákara, as stated by himself (सोमाकरोऽहं विवृणोमि शास्त्रम्).

पंचसंवत्सरमययुगाध्यक्षं प्रजापतिं ।
दिनर्त्वयनमासांगं प्रणम्य शिरसा शुचिः ॥१॥
ज्योतिषामयनं कृत्स्नं प्रवक्ष्याम्यनुपूर्वशः ।
ब्राह्मणेंद्राणां संमतं यज्ञकालार्थसिद्धये ॥२॥*

"Having bowed with my head to the lord of the universe, the overseer of the quinquennial Yuga, whose members are days, seasons, half-years, and months, I shall explain in order, full of purity, the whole course of the celestial luminaries, as it is approved by the chief Brahmans, for the accomplishment of those objects which are dependent on the times fixed for sacrifices."

The next verse explained by the commentator does not occur here in the MSS. of the text †; but it is found towards the end of the Jyotisha, and is quoted also as belonging to this Vedánga in Rádhakant's S'abdakalpadruma:

* As I differ in the translation of these two verses from the explanation given by the commentator, I subjoin his own words: एतेन श्लोकद्वयेन शास्त्रकारोऽभिधेयभूतामिष्टदेवतां नमस्कृत्य वस्तूपन्यासं करोति । तद्यथा । शुचिरहं । वाङ्मनःकायशुद्धो ज्योतिषामयनं सूर्येचंद्रनक्षत्राणां गमनं वक्ष्यामि । कथयिष्यामि । कथं । अनुपूर्वशः । यथाक्रमेणेत्यर्थः । कीदृशं । कृत्स्नं । यागकालविधिज्ञानतया व्यापकं । तथा संमतं ब्राह्मणेंद्राणां । यजमानानामभिप्रेतं । एते वै यज्ञस्येंद्रा इति श्रुतेः । किमर्थं । यज्ञकालार्थसिद्धये । यागचोदितकालविधानार्थमित्यर्थः । किं कृत्वा । प्रणम्य । नमस्कृत्य । कं । प्रजापतिं । सहस्रारं । केन । शिरसा । उत्तमांगेन । कीदृशं । पंचसंवत्सरमयं । संवत्सरपरिवत्सरेदावत्सरानुवत्सरेद्वत्सरात्मकं । तथा युगाध्यक्षं । कृतादीनां द्वादशानां च सहस्रारं (द्वादशारं?) । तथा दिनर्त्वयनमासांगं । कालावयवा दिनादयो यस्यांगानि ।.

Other MSS. have विप्राणां संमतं लोके instead of ब्राह्मणेंद्राणां संमतं; the commentator reads मयं in the first and कृत्स्नं in the third line. Between the first and second, the following stanza is inserted:

प्रणम्य शिरसा कालमभिवाद्य सरस्वतीं ।
कालज्ञानं प्रवक्ष्यामि लगधस्य महात्मनः ॥

"Having bowed with my head to Kála (time), and having saluted Sarasvatí (goddess of eloquence), I shall promulgate the knowledge of time of the highminded *Lagadha*." This would be important as giving the name of the reputed author, Lagadha; but the whole verse is ignored by the commentator. As *Magadha* is considered the birthplace of several of the exact sciences of the Hindus, and as particularly Magadha-measures were widely used in India after they had been first introduced or regulated by the physician *Charaka* and others, one might be led to suppose that the original reading had been *Mágadha*, meaning a native of Magadha. But all the MSS. agree in Lagadha in this as well as in another passage of the Jyotisha, without however giving any more information about the author.

† On the strength of this and similar differences other scholars admit two Jyotishas, one for the Rig-veda, another for the Yajur-veda. See my History of Ancient Sanskrit Literature, p. 211.

वेदा हि यज्ञार्थमभिप्रवृत्ताः कालानुपूर्व्या विहिताश्च यज्ञाः ।
तस्मादिदं कालविधानशास्त्रं यो ज्योतिषं वेद स वेद यज्ञं ॥३॥

"The object of the Vedas is the sacrifice, and the sacrifices are instituted according to a certain order of time. Therefore whosoever knows this Jyotisha, imparting the doctrine of the regulation of time, he will know the sacrifice *."

The next verse, according to the commentary, is,

यथा शिखा मयूराणां नागानां मणयो यथा ।
तद्वद्वेदांगशास्त्राणां गणितं मूर्ध्नि संस्थितं ॥४॥

"Like the crests of peacocks, like the gems (in the heads) of serpents, so is calculation placed at the head of the Vedánga doctrines."

Then follows in the commentary:

माघशुक्लप्रपन्नस्य पौषकृष्णसमापिनः ।
युगस्य पंचवर्षस्य कालज्ञानं प्रचक्षते ॥५॥

"They teach the knowledge of time of the quinquennial lustrum, which begins with the light half of the month Mágha, and ends with the dark half of the month Pausha †."

Then follow the verses on which Colebrooke founded his chronological calculations:

* Comm. वेदा ऋग्वेदादयः किल हि यस्माद्यज्ञार्थमभिप्रवृत्ताः । अभिप्रपन्नाः प्रणीता उत्पन्नाः । तद्यथा स्मृतिः । अग्निवायुरविभ्यश्च त्रयं ब्रह्म सनातनं । दुदोह यज्ञसिद्ध्यर्थमृग्यजुःसामलक्षणमिति । तथा कालानुपूर्व्या विहिताश्च यज्ञाः । दिनत्वैयनेषु विभक्ताः श्रुताः । यथा पुण्याहे दीक्षा । वसंते ज्योतिष्टोमेन यजेत । यजेत वाजपेयेन ग्रीष्म इति । तथा पंचशारदीय इति । तस्मादिदं कालविधानशास्त्रं । अनेन हि कालावयवा विज्ञायंते । यो ज्योतिषं वेद स वेद यज्ञं । ज्योतिःशास्त्रज्ञः कालस्वरूपज्ञतया यथोक्तयज्ञफलभाग्भवतीत्यर्थः । न वै सु विदुरिव पुण्यनक्षत्रमिति श्रुतिः । तथा च परिशिष्टकृत् ।

मंत्रपादपदसंधिविधिज्ञो धातुनामवचनप्रकृतिज्ञः ।
ईदृशो भवति यज्ञविधिज्ञः पक्षमासतिथिचंद्रगतिज्ञः ॥

† Comm. एवमिह ज्योतिर्विदः कालज्ञानं तत्स्वरूपप्रतिपादनं वदंति । कस्य । युगस्य । कीदृशस्य । पंचवर्षस्य । संवत्सरादीनां पंचीकृतं । यतश्चत्वारि मानानि पक्षमाणानि । सौरसावनचांद्रार्क्षाणि । तेषां च यतः परस्परवैषम्येण कालवैषम्यं । यतः सावनस्य संवत्सरस्य प्रकृत्यैव षड् दिनानि लुप्यंते सौरमानापेक्षयाऽथपंचस्यानि (sic) तानि त्वधिकमासाभ्यामापूर्यंते । यतस्तौ द्वौ युगमध्ये भवतः । ते च युगा द्वादश । वैष्णवबार्हस्पत्यैंद्राग्नत्वाष्ट्राहिर्बुध्न्यपित्र्यसौम्यवैश्वदेवसावित्रैन्द्रदाक्षभाग्याः । तैः पञ्चाब्दनिष्पत्तिः । ततः साम्यं भवति । सौरमानापेक्षया तस्य कुतः प्रवृत्तिरित्याह । माघशुक्लेति । तदादिकालगणनेत्यर्थः । तथा च लौगाक्षिः । माघ्याः पौर्णमास्याश्चतुरहः पुरस्तात्संवत्सराय दीक्षंत इति । एवमेव पौषकृष्णसमापिनः ।.

स्वराक्रमेते सोमार्कौ यदि साकं सवासवौ ।
स्यात्तदादि युगं माघस्तपः शुक्लोऽयनं ह्युदक् ॥ ६ ॥ *

" When the sun and moon ascend the sky together, being in the constellation over which the *Vasus* preside, then does the (quinquennial) cycle begin, and the (month) *Mágha*, and the warmth, and the bright (fortnight), for the path (of the sun) is north."

प्रपद्येते श्रविष्ठादौ सूर्यचंद्रमसावुदक् ।
सार्पार्द्धे दक्षिणार्कस्तु माघश्रावणयोः सदा ॥ ७ ॥ †

" The sun and moon turn towards the north at the beginning of *S'ravishṭhá*; but the sun turns towards the south in the middle of the constellation over which the *Serpents* preside; and this (the turning towards the north and towards the south) always (happens) in (the month of) *Mágha* and *S'rávana* ‡."

घर्मवृद्धिरपां प्रस्थः क्षपाह्रास उदग्गतौ ।
दक्षिणेतौ विपर्यस्तौ षण्मुहूर्त्त्ययनेन तु ॥ ८ ॥ §

" In the northern progress, an increase of day and decrease of night take place, amounting to a prastha (or 32 palas) of water: in the southern progress, both are reversed (i. e. the days decrease and the nights increase), and (the difference consists), by the journey, of six muhúrtas."

* Comm. सवासवौ धनिष्ठायां नक्षत्र इत्यर्थः । तथा च नक्षत्रे यदि बृहस्पतिरास्ते तदादिक्रमेतदित्याह । स्यात्तदादि युगं । तदादि युगप्रारंभो भवेत् । तथा तदैव माघो मास श्चतुर्थो भवेत् । तथा स एव तपो मासो भवेत् । तपश्च तपस्यश्चेति श्रुतौ । तथा शुक्लः पक्ष इति वाक्यशेषः । तथा तदैव यस्मादुदगयनं भवेदिति प्रतिज्ञा ॥ ननु यद्येवं कथमृतूनां वसंतो मायत्र श्राद्यः । तत्पूर्वाः ऋतव इति । उच्यते । तास्तु यज्ञानां कर्मानुष्ठानाभिधायकत्वेन प्रवृत्ताः ॥

† Comm. सर्वेषु युगेषु सूर्याचंद्रमसावुदक्प्रवृत्तिं प्रपद्येते श्रविष्ठादौ । प्रथमेंऽशे । तथा सार्पार्द्धेऽश्लेषमध्ये ग्रीष्मांते सूर्यो दक्षिणां प्रपद्यते । एवं तस्यायनं माघश्रावणयोः सर्वकालं पंचस्वपि संवत्सरेष्वित्यर्थः ।.

‡ How this bears on the proper time for certain sacrifices may be seen from passages like तत्र पशुर्नित्यः काम्यश्च । तत्र नित्यः षट्सु मासेषु यावज्जीवं प्रयोज्यः । माघमासे धनिष्ठानक्षत्रगते सवितर्येकस्य पशोः कालः । आषाढे आश्लेषोत्तरार्द्धगते सवितर्यन्यस्य पशोः कालः (MS. E. I. H. p. 288, 2). "The animal sacrifice is either obligatory or voluntary. The obligatory one must be performed every six months during life. The time for one is in the month of Mágha, when the sun has gone to the Nakshatra Dhanishṭhá; the time for the other is the month *Ásháḍha*, when the sun has entered into the second half of *Ás'leshá*."

§ Comm. तस्य सूर्यस्योदग्गतौ निमित्ते घर्मवृद्धिर्भवतीति वाक्यशेषः । घर्म इत्यहर्नाम । घर्मो घ्रंसो घृणिरित्यहर्नामसु पठितं । तथा क्षपाह्रासः । क्षपेति रात्रिनाम । क्षपा शर्वरीति रात्रिनामसु पठितं । तदाप्रभृति दिनानि वर्धंते । रात्रिश्चापक्षीयते । एवमेव तस्य दक्षिणेतौ विपर्यासः । कियती वृद्धिरित्याह । षण्मुहूर्ती । एकमयने वृद्धिह्रासौ । तथा च सापि कियतीत्याह । प्रस्थः । द्वात्रिंशत्पलिकमित्यर्थः ।.

It is, however, only in the first year of each quinquennial cycle, that Sun and Moon are said to be together on the first of Mágha, in the Constellation of the Vasus, at the winter solstice. For the intervening years their relative position is thus given:

1st Year (called Samvatsara *, sacred to Agni).

Winter solstice:	Sun,	1st of Mágha,	in the beginning of Śravishṭhá.
	Moon,		in the beginning of Śravishṭhá.
Summer solstice:	Sun,	7th of Śrávaṇa,	in the middle of Áśleshá.
	Moon,		in Chitrá.

2nd Year (called Parivatsara, sacred to Arka).

Winter solstice:	Sun,	13th of Mágha,	in the beginning of Śravishṭhá.
	Moon,		in Árdrá.
Summer solstice:	Sun,	4th of Śrávaṇa (dark half),	in the middle of Áśleshá.
	Moon,		in Púrva-Bhádrapadá.

3rd Year (called Idávatsara, sacred to Váyu).

Winter solstice:	Sun,	10th of Mágha (dark),	in the beginning of Śravishṭhá.
	Moon,		in Anurádhá.
Summer solstice:	Sun,	1st of Śrávaṇa,	in the middle of Áśleshá.
	Moon,		in the middle of Áśleshá.

4th Year (called Anuvatsara, sacred to Indra).

Winter solstice:	Sun,	7th of Mágha,	in the beginning of Śravishṭhá.
	Moon,		in Aśviní.
Summer solstice:	Sun,	13th of Śrávaṇa,	in the middle of Áśleshá.
	Moon,		Púrva Asháḍhá.

5th Year (called Idvatsara, sacred to Mṛityu).

Winter solstice:	Sun,	4th of Mágha (dark),	in the beginning of Śravishṭhá.
	Moon,		in Uttara Phalguní.
Summer solstice:	Sun,	10th of Śrávaṇa,	in the middle of Áśleshá.
	Moon,		in Rohiṇí †.

* On these names see Weber, Naxatra, p. 298; Taitt. S. V, 5, 7, 3, 4. Váj. Sanh. 27, 45. Taitt. Br. III, 10, 4, 1. Káṭh. 13, 15; 39, 6; 40, 6 (five). Váj. S. XXX, 5. Taitt. A. IV, 19, 1 (six). Panchav. Br. XVII, 13, 17. Taitt. Br. I, 4, 10, 1 (four). Taitt. S. V, 7, 2, 4. Ath. Sanh. VI, 55, 3 (three). Taitt. A. X, 80. Kauś. 42 (two). See also Boehtlingk and Roth, s. vv.

† This would show that the months are to be considered as sávana months of 30 Ahorátras each, and that therefore 12 such months + 12 days are necessary to fill a lunar year of 372 days. In order

These extracts are sufficient to enable astronomers to form an idea of the real character of this treatise, which altogether consists of about thirty-six verses. It was clearly written at a time when more was known of astronomy than was required for the ancient calendar of the Vedic festivals. The general notions which its author lays down for fixing the beginning of the year, the months, and seasons, and the proper times of the Vedic sacrifices, had been handed down by the tradition of priestly families; they were not invented by himself. He was forced to surrender the more scientific astronomical notions current in his own time, and had to adapt himself to the more primitive notions of those who had composed the hymns and Bráhmaṇas, and had settled the sacrifices of the Vedic age. He may have reduced those primitive astronomical notions to a more systematic form than they ever had in the minds of the early Rishis; but in a case like the one which occupies us at present, the beginning of the year and the position of the solstitial points, we may fairly grant to Colebrooke and others, that there was a real tradition which fixed these important points as they are fixed in the Jyotisha; nay, we may believe that for sacrificial purposes these points were still supposed to be in the same position even at a time when, by the laws of nature, they had considerably receded from it.

The next question, then, which arises is this, Does the traditional position of the solstitial points, as recorded in the Jyotisha, point back to the fourteenth century B.C. as the only time in which it could have been the result of actual observation? Colebrooke does not enter into details. He simply affirms that the position of the solstitial points at the beginning of Dhanishṭhá and in the middle of Áśleshá could have been a reality at no time except in the fourteenth century B.C. He depends, in fact, on Davis, who, in his Essay on the Astronomical Computations of the Hindus (As. Res. II. p. 268), recorded the position of the colures, as observed by Paráśara,—this being identical with that of the Jyotisha;—and on Sir W. Jones, who, in a Supplement to this Essay (As. Res. II. 393), touched on the same subject. After fixing the date of Varáha Mihira, from the observation of the solstitial points at his time, at 499 A.D., Sir William writes: "By Newton's demonstrations, which agree as well with the pheno-

to bring the winter solstice, which in the third year falls on the 10th of Mágha (dark half), in the fourth year back to the 7th of Mágha (light half), a month of 30 days must have been intercalated; and in the same manner another sávana month must have been added at the end of the fifth year, in order to bring the winter solstice, which fell upon the 4th of Mágha (dark half), back to the 1st of Mágha (light half).

mena as the varying density of our earth will admit, the equinox recedes about 50″ every year, and has receded 17° 55′ 50″ since the time of Varáha, which gives us more nearly in our own sphere the first degree of Mesha in that of the Hindus. By the observation recorded in older Śástras, the equinox had gone back 23° 20′, or about 1680 years had intervened between the age of the Muni (Paráśara) and that of the modern astronomer: the former observation, therefore, must have been made about 2971 years before the 1st January 1790, that is, 1181 before Christ."

In the fifth volume, however, of the Asiatic Researches, p. 288, Colonel Wilford published the following new Supplement to Sir W. Jones' Supplement:

"It has been stated," he writes, "that Paráśara lived about 1180 years B.C., in consequence of an observation of the places of the colures. But Mr. Davis having considered this subject with the minutest attention, authorizes me to say, that this observation must have been made 1391 years B.C. This is also confirmed by a passage from the Paráśara-Sanhitá, in which it is declared, that the Udaya or heliacal rising of Canopus (when at the distance of thirteen degrees from the sun, according to the Hindu astronomers) happened in the time of Paráśara on the tenth of Kárttika; the difference now amounts to twenty-three degrees. Having communicated this passage to Mr. Davis, he informed me that it coincided with the observation of the places of the colures in the time of Paráśara."

Thus vanishes the fourteenth century; and a fact which was spoken of as beyond the reach of doubt, dwindles down to a statement made by Colonel Wilford, the result of a private conversation with Mr. Davis! With all possible regard for Mr. Davis and Colonel Wilford, we cannot accept such assertions in lieu of proof.

The astronomical interpretation of the position of the solstitial points, as recorded in the Jyotisha, led Mr. Bentley to the year 1181 B.C. Archdeacon Pratt, who lately reexamined the whole evidence, arrives at the same result. His calculations may best be stated in his own words, from a letter addressed by him to Professor Cowell, March 21st, 1862*.

"In reply to your question, How did Colebrooke deduce the age of the Vedas from the passage which he quotes from the Jyotisha or Vedic Calendar in his Essays (vol. I. p. 110)? I beg to send you the following remarks:

* Journal of the Asiatic Society of Bengal, 1862, p. 51.

"In that passage it is stated that the winter solstice was, at the time the Vedas were written (?), at the beginning of S'ravishṭhá or Dhanishṭhá, and the summer solstice at the middle of Áśleshá.

"Now the Hindus divided the Zodiac into twenty-seven equal parts, called *Lunar Mansions*, of 13° 20′ each. Their names are

1. Aśviní	10. Maghá	19. Múla
2. Bharaṇí	11. P. Phalguní	20. P. Áshádhá
3. Krittiká	12. U. Phalguní	21. U. Áshádhá
4. Rohiṇí	13. Hasta	22. S'ravaṇa
5. Mrigaśiras	14. Chitrá	23. Dhanishṭhá
6. Árdrá	15. Sváti	24. S'atabhishá
7. Punarvasu	16. Viśákhá	25. P. Bhádrapadá
8. Pushya	17. Anurádhá	26. U. Bhádrapadá
9. Áśleshá	18. Jyeshṭhá	27. Revatí.

"The position of these lunar mansions among the stars is determined by the stars themselves and not by the sun, and is therefore unaffected by the precession of the equinoxes. If, therefore, we can determine their position at any one epoch, we know their position for all time. The Hindu books furnish us with the requisite information. In the translation of the Súrya-siddhánta, published in the Bibliotheca Indica, Chap. VIII. p. 62, you will find that the conspicuous star Regulus, or α Leonis, is placed by the Hindu astronomers at 4 signs, 9 degrees from the beginning of these lunar mansions (or asterisms, as they are there called). As 4 signs equal one-third of the whole zodiac, they equal 9 lunar mansions. Hence the position of Regulus is 9° in Maghá, the 10th lunar mansion.

"But by the Jyotisha, the summer solstice was in the middle of Áśleshá, the 9th lunar mansion, at the epoch of the Vedas: therefore Regulus was half a lunar mansion + 9°, that is, 15° 40′, east of the summer solstice at that time.

"By the Nautical Almanac for 1859, the position of Regulus is given as follows:—

"Right ascension, January 1st, 1859, ... 10h. 0m. 53s.
"North declination, ditto, ... 12° 39′ 12″·7.

"From this I obtain, by spherical trigonometry, the following result:—

"Longitude of Regulus, January 1st, 1859, ... 147° 52′ 30″.

"Hence Regulus was east of the summer solstice at that date by 57° 52′ 30″. The summer solstice had, therefore, retrograded through 42° 12′ 30″ = 42°·208 since the epoch of the Vedas. As the equinoxes and solstices move backward on the ecliptic at the rate of 1° in 72 years, it must have occupied 72 × 42°·208 = 3039 years to effect this change.

"Hence the age of the Vedas was 3039 on 1st January, 1859; or their date is 1181 B. C., that is, the early part of the twelfth century before the Christian era.

"This differs from Mr. Colebrooke's result: he makes it the fourteenth century. Two more degrees of precessional motion would lead to this; but where he gets these from, I do not know, unless it be by taking the *constellations* loosely, instead of the exact lunar mansions. Thus Dhanishṭhá being taken to be the lunar mansion above which the Dolphin occurs, it is possible that he may have considered the first star in the constellation Dolphin to be the 'beginning of Dhanishṭhá' alluded to in the Jyotisha; and similarly he may have taken a star in the middle of Hydra's head to represent the 'middle of Ásleshá.' But even this supposition will not carry us into the fourteenth century. If we take the first star ε in Dolphin and the opposite star ζ in Hydra's head to be the solstitial points, the precessional motion will only be about 40′ more than above, and the date will be B. C. 1229 or late in the thirteenth century. But then ζ is not in the middle of Hydra's head; it is about 2° east of it; and therefore I have no doubt the lunar mansion, and not the constellation, is what the Jyotisha refers to, and the early part of the twelfth century is the correct result."

This lucid statement of so careful a reasoner as Archdeacon Pratt shows clearly that the position of the solstitial points as recorded in the Jyotisha, belongs to the twelfth, not to the fourteenth century B. C.

It is not my wish to invalidate the conclusions that have been drawn from the recorded observation of the colures. But I feel bound to remark that unless there was internal evidence that the Vedic hymns reached back to that remote antiquity, this passage in the Jyotisha would by itself carry no weight whatever. First, it might be perfectly true that such an observation was really made, as recorded in the Jyotisha, but where is there the slightest hint that at the same time a single Vedic hymn had been in existence, or, as has been asserted with greater boldness than discretion, that a collection of Vedic hymns was completed? As well might we say that because the Prayer-book contains a Table to find Easter-day founded on the Gregorian Calendar, therefore the

Service for Charles the Martyr must have been composed, and the collection of the Prayer-book have been completed before the year 1582. But, secondly, the manner in which the observations of the solstitial points are recorded, is so vague and unscientific that any astronomical critic, at all unfriendly to the pretensions raised by Sanskrit scholars in favour of a high antiquity of the Vedic hymns, could dissect them without difficulty. What is thought of the accuracy of Indian observations even when, after the model of the Greek, they had framed a system of scientific astronomy, may be seen from the remarks of Professor Whitney, Súrya-siddhánta, pp. 212 and 220. It is not too much to say, and every practical astronomer I have consulted has confirmed my opinion, that, to judge from their much later performances, the Bráhmans in the twelfth century B. C. had no means for observing with astronomical accuracy the solstitial points, a task by no means easy even at the present day; and in deducing any chronological dates from observations so loosely recorded as those of the Jyotisha, a margin of several centuries ought to be left on either side.

The truth therefore is simply this, that the dates derived from the observation of the solstitial points in the Jyotisha are welcome as confirmatory evidence, after we have from internal evidence established the existence of Vedic poetry in the twelfth century B. C., but by itself this observation would be of no use for establishing the age of Vedic literature.

As I have been obliged to enter so fully into a controversy which most Sanskrit scholars would consider as closed long ago, I may, for completeness sake, mention one or two attempts of the same kind which, if too much importance has been attributed to Colebrooke's speculations—not, however, by himself, but by his indiscriminate admirers—have been treated with perhaps greater neglect than they deserved.

Bentley, in his Historical View of the Hindu Astronomy, (Calcutta, 1823,) a work which has been justly criticised by Professor Whitney in his Súrya-siddhánta, has the following remarks. After treating of the position of the solstitial points, the same as recorded in the Jyotisha, and deducing from it the date 1181 B. C., he states that at a still earlier period the autumnal equinox was, not as in 1181 B. C. at 3′ 20″ of the asterism Viśákhá, but just on the middle of it, and that hence the name of Viśákhá. According to Bentley, Viśákhá received its name from the equinoxial colure cutting it in the middle, and thereby bisecting it, or dividing it into two equal sections or branches.

Although the meaning commonly ascribed to viśákha is 'branchless,' yet viśákha may mean, and originally did mean, 'possessed of two expanded branches,' 'branched,' 'bisected,' like vidala, 'opened,' 'split,' vidruma, 'coral,' i. e. 'with expanded stems,' and other adjectives in which *vi*, before a substantive, is not used in a privative sense. So far nothing could be said against Bentley's view. But that the asterism Viśákhá was so called from the equinoxial colure bisecting it, and not from any other cause, is a mere conjecture, which may be right or wrong, but which requires stronger proof than Bentley has adduced in support of it. He maintains that the original name of the asterism was Rádhá, and he takes the name of the asterism immediately following, Anurádhá, in the sense of *post-Rádham*. He then proceeds to adjust the other points in accordance with the autumnal equinox bisecting Viśákhá, which gives him (page 2)—

The vernal equinoxial point in the beginning of Kṛittiká;
The summer solstice in 10° of Áśleshá;
The autumnal equinox in the middle of Rádhá, thence called Viśákhá;
And the winter solstice in 3° 20′ of Dhanishṭhá.

He then proceeds:

"In order to ascertain the time when this observation was made, we must find the precession from the position of some of the fixed stars at the time. Thus the longitude of Cor Leonis (Regulus) in the lunar mansion *Maghá* is always 9°. The vernal equinoxial point was found by the observation to be in the beginning of Kṛittiká; and from the beginning of Kṛittiká to the beginning of Maghá is seven lunar mansions of 13° 20′ each, and therefore equal to 93° 20′

Add longitude of Cor Leonis in Maghá	9	0
Their sum is the longitude of Cor Leonis from Aries 102		20
Longitude of Cor Leonis in A. D. 1750 was 146		21
Difference in the precession	44	1,

or the quantity by which the equinoxes fell back in respect of the fixed stars since the time of the observation. Now to find the number of years corresponding to this precession, it must be observed that, as we go back into antiquity, the rate of precession diminishes about 2″, 27 for every century. If we assume that the observation was made 1450 B. C., then $\frac{1450+1750}{2}=1600$; from which subtracting 1450, we get A. D. 150 for the middle point. Now in the first century of the Christian era, the precession was 1° 23′ 6″4, to which if we add 2″27, we get 1° 23′ 8″67 for the mean precession; that is to say, the precession that

corresponds to the second century of the Christian era, in which the middle point is found. Therefore, as 1° 23′ 8″65 is to 100 years, so 44° 1′ to 3176 years; from which subtracting 1750, we get 1426 B.C. for the time of the observation, and the formation of the lunar mansions."

It cannot be denied that the same objections which apply to Colebrooke's calculations, apply in a still stronger degree to this argument of Bentley's. But, with these necessary qualifications, Bentley's statements are certainly deserving of more attention than they have hitherto received. Though I know of no passage in Vedic literature * where the vernal equinox is referred, by astronomical observation, to the lunar mansion of the Kṛittikás, it is true that the Kṛittikás occupy the first place in all the ancient lists of the Nakshatras, even when it is distinctly stated that the winter solstice was at the beginning of S'ravishṭhá, and hence the vernal equinox at the last quarter of Bharaṇí. For sacrificial purposes, in fact, the Kṛittikás are always to be considered as occupying the first place among the Nakshatras †, and in the Jyotisha itself, though the vernal equinox would fall, as we saw, at the end of Bharaṇí, Agni, the presiding deity of the Kṛittikás, stands first in the list. The same applies to the lists of the Nakshatras contained in the Taittiríya-Sanhitá IV. 4, 10, 1; and in the Taittiríya-Bráhmaṇa I. 5, 1, 1. In the Taitt. Br. I. 5, 1, 7, it is distinctly stated that the Nakshatras of the gods begin with the Kṛittikás and end with Viśákhá; whereas the Nakshatras of Yama (so called because Yama presides over the last of them) begin with the Anúrádhas and end with the Apabharaṇ'is. In the third book of the Taittiríya-Bráhmaṇa, the Kṛittikás, with Agni as their deity, occupy again the first place. Even in the Atharva-veda (I. 19, 7), in a passage of decidedly modern date, and in the Law-book of Yájnavalkya (I. 267), the Kṛittikás continue to occupy their early position.

Although, however, the Kṛittikás retained their place even in later works which treat of sacrificial and astrological subjects, they were supplanted by the lunar mansion of Aśviní in the later astronomical literature. At what time that change took place is difficult to determine with exactness. It could not have been till the vernal equinox actually touched Aśviní, having receded from the Kṛittikás and from the intervening mansion of Bharaṇí. It must have been before Varáha Mihira (499 A. D.), at whose time the equinox fell in the beginning

* The vernal equinox is referred to the first degree of Kṛittiká in later works; for instance, in the Vishṇu-Puráṇa, p. 224.

† तेषां सर्वेषां नक्षत्राणां कर्मसु कृत्तिकाः प्रथममाचक्षते । Jyotisha-bháshya, p. 3. a.

of Aśviní. All works in which the lists of the Nakshatras begin with Aśviní must be later than the first year in which the equinox touched Aśviní, and this would tend to fix the date of the Amara-kosha (I. 1, 2, 23) and other works*; but it does by no means follow that works in which the Kṛittikás are mentioned as the first Nakshatra are therefore prior even to Varáha Mihira, nor has it ever been proved by Bentley or by others, that any actual observation took place when the equinox coincided with Kṛittiká.

The Kṛittikás, as has been shown by Colebrooke and others, are the same stars which are familiar to us under the name of the Pleiads; and it is curious to observe that the same uncertainty as to their number, which in Greece gave rise to well-known legends †, existed to a certain degree in India. The statement in Boehtlingk and Roth's Dictionary, that their number was six, is, in this general form, hardly correct; for though that number is given in later astronomical works (see Colebrooke's Miscellaneous Essays, II. 331; Súrya-siddhánta, ed. Whitney, p. 184), the earliest authorities speak of the Kṛittikás as seven. Their names are mentioned (Taitt. Sanh. IV. 4, 5, 1, and Taitt. Br. III. 1, 4, 1); as, 1. Ambá, 2. Dulá, 3. Nitatni, 4. Abhrayantí, 5. Meghayantí, 6. Varshayantí, 7. Chupuṇíká ‡. It was therefore not a numerical fancy which in Greece fixed the number of the Pleiads at seven; but it is more likely that one of the seven stars, which Hipparchus still affirms to have been visible in a clear moonless night, lost its primitive splendour,—a fact by no means without a parallel in the history of astronomy.

The next calculation of Bentley's shows his ingenuity as much as his want of critical caution. The names of the planets on which he builds his theory are believed to be of very modern origin §, or, at all events, they have never been met with as yet either in the Vedas, or in any of the early productions of Sanskrit literature. Nevertheless, if his calculations are right, the coincidence between these modern names and the ancient astronomical facts to which they owe their origin, is all the more interesting, and requires an explanation at the hands of experienced astronomers. Daksha, says the legend, gave his twenty-seven daughters, the lunar asterisms, to the moon. From the union of the

* Cf. Hemachandra-kosha, 108.

† Sir C. Lewis, Historical Survey of the Astronomy of the Ancients, p. 65.

‡ Their number is stated by the commentators on Taitt. Br. I. 5, 1. The third name is Nitatniḥ in the Taitt. Sanh.

§ The Váyu-Puráṇa appeals to the Śruti, the Hinga-Puráṇa to the Smṛiti, in support of the legendary derivation of the names of the planets. See Vishṇu-Puráṇa, p. 225.

daughters of Daksha with the moon, the ancient (?) astronomers feigned the birth of four of the planets, that is to say, Mercury from Rohiṇi; hence he is called Rohiṇeya after his mother. Maghá brought forth the beautiful planet Venus; hence one of the names of that planet is Maghábhú. The lunar mansion Asháḍhá brought forth the martial planet Mars, who was thence called Asháḍhábhava, and Púrva phalguní brought forth Jupiter, the largest of all the planets, and the tutor of the gods; hence he is called Púrva-phalguníbhava: the moon, the father, being present at the birth of each. The observations here alluded to are supposed by Bentley to have been occultations of the planets by the moon, in the respective lunar mansions from which they are named. They are supposed to be occultations, because they are not made in the time of a single revolution of the moon, but take place in the space of about sixteen months, from 19th August 1425, to the 19th April 1424 B. C.; and this idea of the observations being confined to occultations is supported by Saturn not being included, because that planet was then out of the moon's course. These occultations would refer us to the years 1424–5 B. C., thus corroborating the result of the observation of the colures.

The planet Mercury and the Moon in Rohiṇí, 17th April 1424 B. C.
The planet Jupiter and the Moon in Púrva Phalguní, 23rd April 1424 B. C.
The planet Mars and the Moon in Púrva Asháḍhá, 19th August 1424 B. C.
The planet Venus and the Moon in Maghá, 19th August 1425 B. C.

All within the space of about sixteen months; and there is no other year, as Bentley affirms, either before that period or since, in which they were so placed or situated. Saturn is not mentioned among these births, probably from his being situated out of the moon's course; but was feigned to have been born afterwards from the shadow of the earth, at the time of churning the ocean, or the war between the gods and the giants."

Finally, Bentley maintains that the names of the twelve Indian months could only have been formed in 1181 B. C. His argument is this:

The position of the twenty-seven lunar mansions at this period would have been as follows:

Names of Nakshatras.	Later Names.	Names of presiding Deities.
1. S'ravishṭháḥ (fem.) 4	S'ravishṭhá, Dhanishṭhá	Vasavaḥ (8)
2. S'atabhishak	S'atabhishak	Indraḥ (Varuṇaḥ III)
3. Púrve Proshṭhapadáḥ (masc.)	P. Bhádrapadá	Aja Ekapád
4. Uttare Proshṭhapadáḥ	U. Bhádrapadá	Ahir Budhniyaḥ
5. Revatí	Revatí	Púshá
6. As'vayujau	As'viní	As'vinau
7. Apabharaṇíḥ (Bharaṇíḥ III)	Bharaṇí	Yamaḥ
8. Kṛittikáḥ 7 (fem.)	Kṛittiká	Agniḥ
9. Rohiṇí	Rohiṇí (Bráhmí, Hem. K.)	Prajápatiḥ
10. Invakáḥ (Mṛigas'írsham III)	Mṛigas'iras. A'grahâyaṇí, A.K.	Somaḥ
11. Báhú (A'rdrá III)	A'rdrá	Rudraḥ
12. Punarvasú	Punarvasu (Yámakau, H.K.)	Aditiḥ
13. Tishyaḥ	Pushya (Sidhya, A. K.)	Bṛihaspatiḥ
14. A's'lesháḥ (A's'resháḥ, fem. III)	A's'leshá	Sarpáḥ
15. Magháḥ (fem.) (Agháḥ, R. V.)	Maghá	Pitaraḥ
16. Purve Phalguní (-níḥ III) (Arjuní, R.V.)	P. Phálguní	Aryamá (17th)
17. Uttare Phalguní (fem. dual)	U. Phálguní	Bhagaḥ (16th)
18. Hastaḥ	Hasta	Devaḥ Savitá
19. Chitrá	Chitrá	Indraḥ (Tvashṭá III)
20. Nishṭyá (Svátí, T. S.)	Svátí	Váyuḥ
21. Vis'ákhe	Vis'ákhá (Rádhá, A. Kosh.)	Indra-Agní
22. Anúrádháḥ (masc.)	Anurádhá	Mitraḥ
23. Rohiṇí, Jyeshṭhaghní (Jyeshṭhá III)	Jyeshṭhá	Indraḥ
24. Múlabarhaṇí (Múlam III. Vichṛitau, T.S.)	Múla	Nirṛitiḥ (Prajápatiḥ III), Pitaraḥ, T.S.
25. Purvá Asháḍháḥ (fem.)	P. Asháḍhá	A'paḥ
26. Uttará Asháḍháḥ	U. Asháḍhá	Vis've Deváḥ
Abhijit (III)	Abhijit	Brahmá (III)
27. S'roṇá	S'ravaṇa	Vishṇuḥ
Names given from Taittiríya-Bráhmana, I. 5. 1 & 2. Important variations occurring in Taittiríya-Br., III. 1. 1–6, marked III: others from Taittiríya-Sanhitá, IV. 4. 10, marked T. S.	Modern names as collected by Prof. Whitney, Súrya-siddh. p. 183. A. K. means Amara-kosha, H. K. Hemachandra-kosha.	

	Six Seasons.	Twelve Months.		Asterisms in which full moon may occur, according to Súrya-siddh. p. 270.	Position of the Sun, 1181 B. C.
1.		1. Mághaḥ,	Tapas	XIV. XV.	Winter solstice, beginning of Sravishthá. Udag-ayanam.
2.	S'is'iraḥ (Thaw)	2. Phálgunaḥ,	Tapasyaḥ	XVI. XVII. XVIII.	
3.					
4.					
5.		3. Chaitraḥ,	Madhuḥ	XIX. XX.	(Vernal equinox, coinciding with Revatí (ζ Piscium), time of Brahmagupta, 582 A. D.)
6.					(Vernal equinox, beginning of Asviní, time of Varáha Mihira, 499 A. D.)
7.	Vasantaḥ (Spring)	4. Vais'ákhaḥ,	Mádhavaḥ	XXI. XXII.	Vernal equinox, last quarter of Bharaní, 1181 B. C.
8.					
9.		5. Jyaishṭhaḥ,	S'ukraḥ	XXIII. XXIV.	
10.					
11.	Gríshmaḥ (Summer)	6. Ásháḍhaḥ,	S'uchiḥ	XXV. XXVI.	
12.					
13.		7. S'rávaṇaḥ,	Nabhas	XXVII. I.	Summer solstice, middle of Asleshá.
14.					
15.					
16.	Varshaḥ (Rain)	8. Bhádrapadaḥ, (Praushṭhapadaḥ)	Nábhasyaḥ	II. III. IV.	
17.					
18.		9. Ás'vinaḥ, (Ás'vayujaḥ)	Iṭ	V. VI. VII.	
19.					
20.					
21.	S'arad (Harvest)	10. Kárttikaḥ,	Úrk	VIII. IX.	Autumnal equinox, second quarter of Visákhá.
22.					
23.		11. Márgas'írshaḥ,	Sahaḥ	X. XI.	
24.					
25.					
26.	Hemantaḥ (Winter)	12. Paushaḥ, (Taishaḥ)	Sahasyaḥ	XII. XIII.	
27.					

There can be no doubt that the names of the months, Mágha, Phálguna, Chaitra, Vaisákha, Jyeshṭha, Áshádha, S'rávaṇa, Bhádra, Ásvina, Kárttika, Márgaśírsha, and Pausha were derived from the names of the twelve lunar mansions, Maghá, Phalguní, Chitrá, Viśákhá, Jyeshṭhá, Ashádhá, S'ravaṇa, Bhadrá, Aśviní, Krittiká, Mrigaśiras, and Pushyá. But it is at first sight difficult to explain why the succession of the months is so different from that of the lunar asterisms. When the sun stands in S'ravishṭhá, with the Vasus, the month is called Mágha, but Maghá is not the first, but the fifteenth Nakshatra; and when the sun is in Áśleshá, with the Serpents, the month is called S'rávaṇa, while Sravaṇa is not the fourteenth, but the twenty-seventh Nakshatra.

Bentley offers the following explanation:

"In the same manner as the lunar mansions were fabled by the Hindu poets to have been married to the moon, and that the first offspring of that poetic union were four of the planets; the Hindu poets feign, that the twelve months sprang from the same union, each month deriving its name in the form of a patronymic, from the lunar mansions in which the moon was supposed to be full at the time.

"Let us therefore, in the case before us, apply this principle. At the above epoch, 1181 B. C., the sun and moon were in conjunction at the winter solstice; and as the months began when the sun entered the signs, the first month therefore began at the winter solstice. Now to find the name of that month, the moon would be full at about $14\frac{3}{4}$ days after the winter solstice, and would then be in the opposite part of the heavens to the sun. The sun would have advanced in $14\frac{3}{4}$ days about $14^{\circ}\frac{1}{2}$, and therefore would have entered the second lunar asterism, S'atabhishá: a line drawn from the point in which the sun is thus situated through the centre, would fall into the lunar asterism Maghá, in which the moon was full, on the opposite side, and consequently, on the principle stated, the solar month was from thence called Mágha in the form of a patronymic. At the next full, the moon would be in Uttara Phalguní, and the solar month from thence called Phálguna; and on this principle all the months of the year were named.

"Hence it is very easy to demonstrate the utmost possible antiquity of the time when the months were, or could be, so named: for there are certain limits beyond which the line cannot be drawn: and these are the termination of the lunar mansion and the commencement of the solar month which determines the time, because it points out the commencement of the solar

month in respect of the fixed stars at the time. Thus, at the time of the above observations, the summer solstitial point was found in the middle of the lunar asterism Áśleshá, and the solar month S'rávaṇa then began; for in the ancient astronomy of the Hindus, that month always began at the summer solstice. Now the month S'rávaṇa derives its name from the lunar asterism S'ravaṇá (the twenty-seventh), then in the opposite part of the heavens. Let, therefore, a line be drawn from the solstitial point, or commencement of the month, cutting the centre, and it will fall into the very end of the lunar asterism S'ravaṇá, from which it derives its name S'rávaṇa; which line is, therefore, at its utmost limit, as it cannot go farther without falling into a mansion of a very different name. This position of the line, therefore, proves that the months received their names at the time of the above observations, and not before. For if we wish to make it more ancient, let the solstitial point be supposed more advanced in respect of the fixed stars, say one, two, or three degrees, then a line drawn from the solstitial point, or commencement of the month S'rávaṇa, cannot fall into any part of the lunar asterism S'ravaṇá, from which it derives its name, but into S'ravishṭhá (the first). Therefore the name which it possesses could never be given to it till the solstitial point, and commencement of the month, actually coincided with the middle of the lunar asterism Áśleshá (the fourteenth), being the same with the observation which refers us to the year 1181 B.C., and this is the utmost antiquity of the formation and naming of the Hindu months."

I have recalled these speculations of Bentley and others, partly because they show considerable ingenuity and open some questions which have not yet been solved by either scholars or astronomers; partly because I wished to convince my critics that if I do not always enter into all the controverted points, the theories, guesses, doubts, assertions, and counter-assertions of various scholars, it is not because I shrink from the trouble of examining them, (much of what is here printed was written twelve years ago,) but because I believe it is our duty, as Frederick the Great * said, to learn to distinguish between what is important and what is not. We only retard the discovery of truth by entering into every by-path on the right and on the left. The straight line is always the best, the simplest machinery the most perfect. If we can prove our point without a great apparatus of so-called learning, it is our duty to do so. He sweeps cleanest that makes the least dust.

* Oeuvres, vol. I. p. 264.

Are the Indian Nakshatras of native or foreign origin?

Another controversy, most seriously affecting, not only the age of Vedic poetry, but the whole history of the growth of the Indian mind in those remote ages, has been revived of late with so much vigour and acrimony, that, though it has hardly yielded a single new result, it cannot here be passed over in silence. The question is, whether one of the simplest and fundamental notions of Indian astronomy, the division of the heavens into twenty-seven equal parts, commonly called the twenty-seven Nakshatras or Ṛikshas, was indigenous to India, or borrowed from without. As one allusion to these Nakshatras occurs in the hymns of the Rig-veda, and as the twenty-seven divisions, with their asterisms and presiding deities, are known in the Bráhmaṇas, the principal charm of Vedic antiquities, namely, its independent originality, would be destroyed, if it could be proved that even at that early time, the rays of a foreign civilisation had influenced the growth of the Indian mind. If so important a subject as the division of the heavens into twenty-seven sections, a division which is at the root of their sacred calendar, and without which none of the sacrifices enjoined in the Bráhmaṇas could be conceived, was borrowed from without, what security would there be that the gods worshipped at the sacrifices, and the hymns repeated at the annual festivals were not borrowed from the same quarter? If at first the movements of the sun, the moon, and the stars suggested the *fasti* or festivals of the ancient world, the regulation of these festivals soon gave rise to a more accurate study of the periodical returns of the heavenly luminaries; and what we call the ancient calendars is but the result of this mutual action and reaction of astronomy and religion. And if that quarter from which the ancient Indian astronomy is supposed to have been borrowed was China, would not all our received ideas on the earliest history of mankind be upset? Would not the national individuality of the Aryan race be tainted in its core, and the Turanian man rise superior to his Aryan and Semitic brothers? Where so much is at stake, it would be wrong to trust to convictions, however firmly rooted; and when the arguments proceed from one of the most eminent men of our age, and are repeated by him, after a lapse of twenty years, with increased warmth and vigour, it is necessary to meet argument by argument, however strong our feeling that the conflict arose from a mere misunderstanding, and ought never to have taken place.

Biot, one of the most eminent among living,—I may now add,—one of the most eminent among departed astronomers *, published a number of articles in the Journal des Savants in the years 1839, 1840, 1845, and again in 1859, 1860, and 1861, in which he endeavoured to prove the Chinese origin of the Indian Nakshatras. He maintained that the number of the Nakshatras was originally twenty-eight, and afterwards reduced to twenty-seven; that originally they did not represent the twenty-seven equal divisions of the Indian ecliptic; that they had no connection with the course of the moon, but were single stars, near the equator, the intervals of which in time had been carefully determined, in order to refer to them the positions of other stars and planets coming to the meridian between them.

Such was the authority which of right belonged to the opinions of so great an astronomer as Biot, and such the learning and ingenuity with which he defended his propositions, that Professor Lassen allowed himself to be swayed by Biot's arguments, and, in his 'Indian Antiquities,' admitted the introduction of the Chinese Sieu into Northern India before the fourteenth century B. C. I quote from the first volume of his excellent work, page 747: "As a primitive intercourse between Hindus and Chinese, never suspected before, is now firmly established, and as the latter employed their Sieu at a much earlier period, it is impossible to use the Chinese origin of the Nakshatras as an argument against their employment by the Hindus at the time of their own most ancient and still preserved astronomical observations. These observations belong to the fourteenth century B.C., and it follows from them that the Hindus were at that time settled in the north of India."

These early observations, however, which were supposed to point to the fourteenth century, presupposed, as we said, the employment of twenty-seven Nakshatras, (otherwise the solstitial points there mentioned would be at unequal distances from each other,) whereas, according to Biot's own statements, the number of the Chinese Sieu was only twenty-four, and was not raised to the number of twenty-eight till the year 1100 B.C. This difficulty did not escape so careful a scholar as Professor Lassen. He admits (p. 745) that the Hindus could not have received the division of the heavens into twenty-eight sections before 1100 B.C.; but, in order to save the early observations of the fourteenth century, he adds (p. 746), that though the complete number of

* S.-B. Biot died the 3rd of February, 1862, eighty-eight years of age.

the twenty-eight Nakshatras was not known in India before that date, their use may have been transmitted there at an earlier period.

I doubt whether even the authority of a Lassen was strong enough to give currency to Biot's theory among Sanskrit scholars; but it soon became apparent that historians and philosophers were attracted by its novelty, and used it as an important help for determining the mutual relations of the principal races of the East at the very dawn of history. The late Mr. Hardwick, in his learned and thoughtful work, 'An Historical Inquiry into some of the chief Parallelisms and Contrasts between Christianity and the Religious Systems of the Ancient World,' 1855-58, had the following remarks on the supposed intellectual intercourse between China and India:

"Before the name of the Middle Kingdom had been ever uttered in the learned halls and avenues of the Athenian Academy; before the eagle of the Roman legions, thirsting after universal sway, had tried its earliest flight across the Central Appennines; before the English of that ancient world, the colonising merchants of Phœnicia, had unfurled their sails upon the waves of the Atlantic, and trafficked in the precious metals on the coasts of Albion and Ierne; large communities of settlers, stretching far across the plateau of Upper Asia, were already living under the patriarchal rule of great and powerful princes. Chinese ports were even then frequented by adventurous traders from Ceylon, from India, from the Persian Gulf. A knowledge of Chinese astronomy found its way beyond the mountains, and took root in Northern Hindustan."—Pp. 7, 8.

In a review of this work, which I published in 1858, I felt it necessary to protest strongly against treating the Chinese origin of the Indian Nakshatras as a recognised fact, and thus disturbing, without sufficient evidence, the early history of Eastern civilisation. I may be allowed to give a short extract from my Review:

"Now, in stating that a knowledge of Chinese astronomy found its way at that early period beyond the mountains, and took root in Northern Hindustan, Mr. Hardwick has the authority of Professor Lassen on his side, or rather that of M. Biot, whose views on this subject were adopted by Professor Lassen. But did Mr. Hardwick consider what is involved in such an admission, and how violently the true relation of these two ancient races, the Aryans in India and the Chinese in the Middle Kingdom, would be disturbed if this admission was

well founded? Astronomy—at least that part of it to which Mr. Hardwick more particularly refers, the *Nakshatras*, or the twenty-seven lunar mansions of the Brahmans—is most intimately connected with the religious worship of the Veda. No Hindu sacrifice could have been properly performed without a knowledge of the lunar mansions; no month could have received its present appellation without names being first given to those constellations from which the months derived their titles. Now, Mr. Hardwick would never admit that a Chinese or Turanian race could have exercised any very definite influence on the faith and worship of the Aryan settlers of India, and he would scout the idea of tracing Sanskrit words back to Chinese monosyllabic terms. Yet, if a knowledge of Chinese astronomy found its way across the mountains, and took root in Northern Hindustan, the event must have taken place at a very early period, previous at least to the composition of the Vedic hymns. The Nakshatras are mentioned in the ancient songs of the Veda. Thus, we read, Rv. I. 50, 2:—'Like thieves, the Nakshatras (the stars) depart every night, before the sun who illuminates every thing.' Here it might be said, that *Nakshatra* signified stars in general, and not the twenty-seven constellations rendered important by the passage of the moon. But it is in connexion with the moon, and therefore with an allusion to an equally-divided lunar zodiac, that the Nakshatras are mentioned in the Veda. 'Soma, or the moon,' it is said, in a hymn of the tenth Maṇḍala (X, 85, 2), 'is placed in the lap of the Nakshatras.' The moon is called the month-maker, másakrid, in the first book of the Rig-veda, at least according to one of the ancient commentators; and one of the principal sacrifices, mentioned in the ceremonial portion of the Veda, is that of the Full and New moon. The exact time of these lunar festivals is fixed with such minute accuracy, that the Hindus, at the time when these public sacrifices were established, or at least when they were regulated by the sacred institutions of the Bráhmaṇas, must have been considerably advanced in astronomy; and the base of their ancient astronomy was the zodiac of the lunar Nakshatras.

"The gradual growth of astronomical knowledge in India is intimately connected with the whole intellectual and religious history of that country. The primitive division of the year into lunar months must have taken place previously to the first separation of the Aryan family, for the name for moon and month is the same in the dialects of nearly all of its members. The

proper names of the months, however, are peculiarly Indian. They exist in Sanskrit only, but not in Greek or Latin. Now these Indian names of the months were derived from the names of the Nakshatras, and the names of the Nakshatras again were derived in several instances from the names of ancient Vedic deities *. If, therefore, we find the same names of the months in Sanskrit and Chinese, and if these names are inexplicable in the Chinese dictionary, surely the conclusion is evident, that they were borrowed by the Chinese from the Hindus, and not by the Hindus from the Chinese. The three winter months are called in Chinese, *Pehoua*, *Mokué*, and *Pholkuna*; names which Dupuis † has compared with the three Indian months, *Paushya*, *Mágha*, and *Phálguna*. These Indian months had received their names according to a definite system, from the corresponding Nakshatras, *Pushyá*, *Maghá*, and *Phálguní*. Shall we suppose, then, that the Hindus borrowed the idea of the lunar Nakshatras from the Chinese, but that the Chinese borrowed their names from the Hindus? In order to defend such a supposition, it would be necessary to establish the antiquity and genuineness of the early literature and civilisation of China on a much firmer basis than that on which it rests at present.

"Mr. Hardwick, who is at other times so sceptical about the early dates which Oriental nations claim for their literature, seems to have lent too willing an ear to the assertions of the Chinese scholars. It is true, that many of the most distinguished 'Sinologues' speak with perfect confidence of Chinese dates, going back as far as three and four thousand years B.C. Such dates occur in the original chronicles of the Chinese, and they are given there as if they had been written down at the time by imperial historiographers and astronomers. But has their value ever been tested by the same critical tests which have reduced the mythical chronology of Greece and Rome to such small dimensions? In Roman history, the destruction of the city and the burning of the Capitol are generally considered fatal to the genuineness of any dates previous to those events. Now, in Chinese history one of the most indisputable facts is, that between 480 and 206 B.C., that is to say, after that period of Chinese literature which is marked by the labours of Confucius and

* Prof. Whitney points out the Vedic character of the deities, Súrya-siddh. p. 203. The important point is, that some of them are *exclusively* Vedic.

† Mémoire explicatif du Zodiaque, par Dupuis, Paris, 1806, p. 15. I cannot ascribe much importance to this argument until these barbarous names mentioned by Dupuis have been authenticated by Chinese scholars.

his collections of the ancient oral traditions of the country, China was devastated by revolutions and civil wars. In 213 B. C., the famous emperor *Tsin-chi-hoang* ordered all books to be burnt, except those treating on medicine, astrology, agriculture, and his own family annals. The punishment of death was threatened and inflicted on those who should venture to conceal books; and all Chinese authorities agree, that, during the years 213 to 206, this literary crusade had proved completely successful. In 206 a new dynasty, that of the *Hans*, came to the throne, and every effort was made by them to collect—and again, for the most part, from oral tradition—the remains of Chinese literature. But whatever the Chinese may relate of the miraculous escape of some of their old classics, and however plausible the arguments may sound by which Chinese scholars have defended the general fact of the high antiquity of Chinese civilisation, it would have been difficult to recover from oral tradition minute astronomical observations. M. Biot feels this himself; and he tries, very ingeniously, to save 'a little of ancient astronomy.' Speaking of the emperor *Tsin-chi-hoang*, he says, 'Il ordonna, sous peine de mort, de brûler tous les livres, à l'exception de ceux qui traitaient de medicine, d'astrologie (*conséquemment un peu d'astronomie*)*.' This language shows sufficiently what the claims of the Chinese to genuine and accurate astronomical observations, fixing the days and hours of historical events, about 4000 B. C., really are; and we cannot bring ourselves to admit that, either in language, religion, or science, the relation of the early Aryans to the Turanian inhabitants of China was that of pupils to their teachers. On the contrary, we believe that the relation of India to China has always been the same which we find at the time when Buddhism was introduced into the Middle Kingdom; and we know of no fact, even in later times, which would lead us to suppose that China had ever repaid to India the debt which it owed to that ancient cradle of Eastern civilisation. If this relation of the two countries is once established and well kept in mind, it would require stronger evidence than

* A still stronger admission has been pointed out by Prof. Weber (p. 300) from Gaubil (Observ. II. 3 seq.). Gaubil says that according to the unanimous testimony of Chinese astronomers, astronomy had been almost entirely neglected after the time of the Tchun-tsieou, edited by Confucius (died 480 B. C.). Eclipses were no longer observed, their calculations were no longer handed to the emperor, the tower of the mathematicians was but seldom ascended, and the science and practice of the astronomical calculus became gradually lost. When the emperor Tsin-chi-hoang ordered the great burning of books, Gaubil continues, "supposé qu'il y eut des livres où il se trouvât des observations celestes et de preceptes d'astronomie, on les perdit: . . . . . il ne restoit que des traditions confuses, des catalogues d'étoiles et de constellations et des fragmens de quelques livres cachés."

the hypothesis even of so learned an astronomer as M. Biot, or the admission of so careful a Sanskrit scholar as Professor Lassen, to induce us on a sudden to invert the relative position of China and India, and to admit a civilising influence, exercised by the former on the latter. Such exceptions occur, no doubt, now and then in the ancient history of religion and civilisation, as well as in the ancient history of language. But, a general rule once being established, the exceptions require very strong evidence before they can be admitted. No one would allow an ancient Sanskrit word to be derived from Greek. But if words of decidedly Greek character have found their way into the Sanskrit dictionary, it becomes more necessary than ever to determine their relative ages: and we shall find that, in every instance, those Greek words, such as the words connected with the solar zodiac, are of a very late date in Sanskrit; in fact, not anterior to the well-established historical intercourse between India and Greece after the time of Alexander.

"We have dwelt rather long on this single question about the Chinese origin of Hindu astronomy; but it will be seen, we hope, that, though it seems to be an isolated fact, it involves important consequences with regard to the organic structure, if we may say so, of the whole ancient civilisation of the East. We do not blame Mr. Hardwick for having been swayed by the authority of such men as Biot and Lassen; but we thought it right to point out how, in travelling over the unexplored and unmapped regions of the ancient world, he might have guarded himself against ever missing the right direction, if, instead of trusting to partial guides, he had clearly impressed on his own mind the great watersheds of thought and language which divide the principal families of the human race. Mr. Hardwick mistakes the place where the currents of Chinese and Indian civilisation effect their first junction."

Shortly after these remarks were published, Biot renewed the controversy about the Chinese origin of the Indian Nakshatras, and he succeeded by his learning and by his eloquence to win the approval of at least one more Sanskrit scholar, but one eminently qualified to express an opinion on such a subject, I mean Professor Whitney, the editor of the Atharva-veda, and of the important astronomical manual, the Súrya-siddhánta. In his Notes on the Súrya-siddhánta the Professor gives a most careful analysis of all the information that could be collected on the Indian Nakshatras, the Chinese Sieu, and the Arabic Manzil. He determines the situation of the stars and groups of stars which, under their Sanskrit, Chinese, and Arabic names, are referred to by the

astronomers of the East, and he arrives at the conclusion, that "after the exhibition of the concordances existing among the three systems, it can enter into the mind of no one to doubt that all have a common origin, and are but different forms of one and the same system." (P. 201.)

He then enters on an examination of Biot's hypothesis, according to which the Indian Nakshatras are derived from the Chinese Sieu. "According to Biot," he writes*, "the Sieu form an organic and integral part of that system by which the Chinese, from an almost immemorial antiquity, have been accustomed to make their careful and industrious observations of celestial phenomena. Their instruments, and their methods of observation, have been closely analogous with those in use among modern astronomers in the West: they have employed a meridian-circle and a measure of time, the clepsydra, and have observed meridian-transits, obtaining right ascensions and declinations of the bodies observed. To reduce the errors of their imperfect time-keepers, they long ago selected certain stars near the equator, of which they determined with great care the intervals in time, and to these they referred the positions of stars or planets coming to the meridian between them. The stars thus chosen are the *Sieu*. Twenty-four of them were fixed upon more than two thousand years before our era, &c." (Pp. 201—203.)

After expressing his entire concurrence in the views of Biot, Professor Whitney proposes nevertheless another theory, according to which the knowledge of Chinese astronomy was not imported straight from China to India, but (p. 205) "was carried, together with the Chinese system of division of the heavens into twenty-eight mansions, into Western Asia, at a period not much

* Súrya-siddhánta, edited by Burgess and Whitney, p. 201 seq. I add the last statement which Biot has left of his views on the Chinese Sieu: "Je vais signaler à l'avance le but unique vers lequel nous allons marcher. Il est tout entier compris dans la proposition suivante, que je me borne à reproduire d'après les énoncés que j'en ai plusieurs fois donnés dans ce journal même: Le trait distinctif de l'astronomie des Chinois, c'est l'observation assidue des astres quand ils passent au méridien, en notant, au moyen des horloges d'eau, les instants où ils se trouvent dans ce plan. Vingt-huit étoiles, réparties sur le contour du ciel, et toujours les mêmes, leur servent comme autant de signaux fixes, auxquels ils rapportent les positions relatives des astres ainsi observés. De cette seule pratique, invariablement suivie depuis un temps immémorial, ils ont su déduire par eux-mêmes les durées moyennes des révolutions du soleil, de la lune, et des planètes; les périodes de temps qui ramènent ces astres en conjonction ou en opposition entre eux; les éléments d'un calendrier luni-solaire suffisant à tous les besoins publics; et aussi une ample provision, incessament renouvelée, de pronostics astrologiques, ce besoin primitif et universel de l'esprit humain." Journal des Savants, 1861, (p. 9.)

later than B.C. 1100, and was then adopted by some western people, either Semitic or Iranian. In their hands it received a new form, such as adapted it to a ruder and less scientific method of observation, the limiting stars of the mansions being converted into zodiacal groups or constellations, and in some instances altered in position, so as to be brought nearer to the general planetary path of the ecliptic. In this changed form, having become a means of roughly determining and describing the places and movements of the planets, it passed into the keeping of the Hindus—very probably along with the first knowledge of the planets themselves—and entered upon an independent career of history in India. It still maintained itself in its old seat, leaving its traces later in the Bundehesh; and made its way so far westward as finally to become known to, and adopted by, the Arabs."

Though I had hoped that some one better qualified than myself would vindicate the Indian origin of the ancient Indian astronomy, and though I consider Professor Whitney, who, to an extensive acquaintance with astronomy adds a scholar-like knowledge of Sanskrit, an antagonist even more formidable than Biot, yet, as I protested against the conclusions of the one, I feel bound to oppose the arguments of the other. I do not see that we gain any thing by assuming an indirect instead of a direct importation of Chinese wisdom into India, particularly if the intermediate stage seems to have no other object than to bring the scientific discoveries of the Chinese down to the level of the Indian understanding. Nor do I see that we fare better if, as Professor Weber * proposes, we admit a spreading of astronomical knowledge from a Semitic centre, and assume the fundamental notions of chrononomy to have been imported from Babylon to China on one side, and to India on the other. I differ *toto cœlo*

* Die Vedischen Nachrichten von den Naxatra; erster Theil, 1860; zweiter Theil, 1862. These Essays are very creditable to the author, and hardly deserved the withering contempt with which they were treated by Biot, (Précis de l'Histoire de l'Astronomie Chinoise, p. 9.) I differ from nearly all the conclusions at which Prof. Weber arrives, but I admire his great diligence in collecting the necessary evidence. It is not necessary, however, to enter on a discussion of all the problems touched upon by the learned author, and I have tried to confine myself as much as possible to the main issues of this already but too complicated controversy. What vitiates many of Prof. Weber's arguments is that he has not made it clear to himself in every instance whether the months he is speaking about are sidereal or synodical. Their relation to the fixed stars (Nakshatras) and to the seasons would be much affected by this difference. At Rome, in spite of intercalary months, January, at the time of Cæsar, occupied the season of the year which ought to have been occupied by October. (Sir C. Lewis, Survey of Ancient Astronomy, p. 237.) Much greater confusion must have existed in ancient India, where the standard measure of time was simply nycthemeric, modified on certain occasions by lunar, solar, or sidereal time.

from every one of these theories. I feel as strongly to-day as I did when, in the year 1846, I read at Paris the articles then published by Biot, that the Brahmans cannot have borrowed the idea of the Nakshatras from the Chinese. I maintain, 1. that the Nakshatras were suggested to the Hindus by the moon's sidereal revolution; 2. that they were intended to mark certain *equal* divisions of the heavens; and 3. that their number was originally twenty-seven, not twenty-eight.

Though the custom of beginning a discussion with verbal definitions has got into disrepute, I think it best to adhere to the old rule; nay, I believe that its observance would have shortened, if it had not prevented, this long controversy. What then is meant by Nakshatra? Nakshatra has three principal meanings. Originally it meant stars in general; secondly, it meant the twenty-seven equal divisions of the heavens, constantly referred to in the Bráhmaṇas and Sútras; and thirdly, it meant the twenty-eight asterisms, consisting of either one or more stars, which in later scientific treatises served as "*points de depart*" for astronomical observations. In order to avoid confusion I shall in future use Nakshatra in the second sense only, translating it by lunar mansions, while I use Tárá instead of Nakshatra, if employed in the third sense, translating it by asterism.

The coincidences between the Indian and Chinese systems of astronomy which struck Biot, and which before him had struck Anquetil and Bentley, refer entirely to the Indian Tárás and the Chinese Sieu. I can understand how an astronomer who for the first time perceives these coincidences, should be strongly inclined to waive all minor differences and assume that the conceptions shared in common by Indian and Chinese astronomers were derived by the Indians from the Chinese, or by the Chinese from the Indians, or by both from a common source. But now that the novelty of the discovery has well nigh passed away, a more sober examination of the case would seem to lead to different results. I cannot agree with Prof. Weber when, in the beginning of his Essay, he asserts that "the thorough analogy or even identity of both systems necessitate the admission of a special relationship." The Sieu were originally twenty-four in number, they were afterwards raised to twenty-eight. There is no trace of a similar change in India. The Sieu throughout are single stars *; the Tárás are, for the most part, groups or clusters of stars.

* Whitney, p. 207.

The system of single stars, Yoga-tárás or junction-stars, is of so decidedly modern a date that Prof. Whitney places its introduction in the sixth century of our era (p. 212). But as to the coincidences themselves, taking it for granted that the Sieu stars are in all cases rightly identified with the stars of our globes, it should be borne in mind, that the identification of the Hindu Tárás is in many cases extremely problematical. Al-Biruni, who, in the eleventh century, attempted for the first time to authenticate the Indian Tárás, relates that the Indian astronomers were unable to point out the stars to him. He was obliged to leave seven or eight as unknown or doubtful *. Sir W. Jones and Colebrooke, who, in more recent times, undertook the same task, complained of the same difficulty. But even in the astronomical works of the Hindus there is some discordance as regards the stated position of the junction-stars of the asterisms †, and with regard to the number of stars comprised in each asterism the opinions vary even more considerably ‡. But if we waive all these objections, nay, if we allow a still further latitude, and count all Sieus and Tárás as identical whenever the Sieu star corresponds with any one star of the Hindu asterisms, what is the result §? Out of twenty-eight Sieus there are seventeen which can be identified with the Tárás. Now, if a scientific system is borrowed, it is borrowed as a whole. When the Hindus borrowed the twelve zodiacal signs, they did not borrow one-half of them only, but the whole. Unless therefore the discordance of nearly one-half of the Hindu and Chinese asterisms can be satisfactorily accounted for, I, for my part, must confess that I do not see so startling a problem that requires to be solved. If certain stars suggested themselves as particularly useful to the Chinese astronomers, some of them, not all, might have recommended themselves for the same reason to the Hindus. Under the supposition that the Hindus were the pupils of the Chinese, the coincidences arising from this cause would be far less startling to me than the differences. On a point like this, however, I shall be inclined to defer to the authority of astronomers, and I am quite prepared to find that sooner or later the differences between the Sieus and Tárás may be accounted for. What then? Every Sanskrit scholar will most readily surrender the whole system of the Tárás and Yoga-tárás, or junction-stars, whether twenty-seven or twenty-eight in number,

* Whitney, p. 181; Journal des Sav. 1845, pp. 39–54. † Whitney, p. 182.
‡ Weber, p. 380 seq. § Whitney, p. 200.

as of foreign origin. It never occurs in the ancient literature of the Brahmans, it is not mingled with any of their ancient rites or traditions. It comes in at a time when India was no longer shut out from the rest of the world, and when a scientific study of astronomy had succeeded to the homely rules of the Vedic priests. That the system of the Súrya-siddhánta points to Greek and Alexandrian models has been proved by Prof. Whitney, and before him, by Colebrooke. Let us hear what Colebrooke said on this subject*:

"The Hindus had undoubtedly made some progress at an early period in the astronomy cultivated by them for the regulation of time. Their calendar, both civil and religious, was governed chiefly, not exclusively, by the moon and the sun: and the motions of these luminaries were carefully observed by them, and with such success, that their determination of the moon's synodical revolution, which was what they were principally concerned with, is a much more correct one than the Greeks ever achieved. They had a division of the ecliptic into twenty-seven and twenty-eight (?) parts, suggested evidently by the moon's period in days, and seemingly their own: it was certainly borrowed by the Arabians. Being led to the observation of the fixed stars, they obtained a knowledge of the positions of the most remarkable; and noticed, for religious purposes, and from superstitious notions, the heliacal rising, with other phenomena of a few.

"Whatever may have been the period when the notion was first obtained, that foreknowledge of events on earth might be gained by observations of planets and stars, and by astronomical computation, or wherever that fancy took its rise, certain it is, that the Hindus have received and welcomed communications from other nations on topics of astrology: and although they had astrological divinations of their own as early as the days of Paráśara and Garga, centuries before the Christian era (?), there are yet grounds to presume that communications subsequently passed to them on the like subject, either from the Greeks, or from the same common source (perhaps that of the Chaldeans) whence the Greeks derived the grosser superstitions engrafted in their own genuine and ancient astrology, which was meteorological.

"Joining this indication to that of the division of the zodiac into twelve signs, represented by the same figures of animals, and named by words of the same import with the zodiacal signs of the Greeks; and taking into consider-

* Miscellaneous Essays, II. 447.

ation the analogy, though not identity, of the Ptolemaic system, or rather that of Hipparchus, and the Indian one of excentric deferents and epicycles, which in both serve to account for the irregularities of the planets, or at least to compute them, no doubt can be entertained that the Hindus received hints from the astronomical schools of the Greeks."

At the time at which Professor Whitney places the selection of the junction-stars to represent the asterisms, namely, in the sixth century of our era, there were Chinese travelling in India, and Hindus settled in China. An Indian religion had been imported into China, Indian festivals were celebrated in that country, and an Indian calendar had to be accommodated to that of the Chinese. At that time it was not only possible, but necessary that some compromise should be effected between the astronomical grammars of the two nations; and I have little doubt that the distinguished scholar whose works have thrown so much light on the intellectual and religious intercourse between China and India in the seventh century A.D., will be able to solve the problem, how it was that some of the Chinese determinative stars were identified with the Tárás or Yoga-tárás of the Hindus, and a twenty-eighth asterism added to the twenty-seven heretofore in use. If the Chinese had been acquainted with India at the early period implied in Biot's theory, would it not be extraordinary that the name of India should never occur in their ancient annals? It is commonly admitted that India was unknown to the Chinese before the expedition of Tchang Khian, 126 B. C., and its usual name, Thian-tchu (Sindhu), is in the Chinese annals mentioned for the first time in the eighth year of the emperor Ming-ti, 65 B. C.* The name of "China" has commonly been supposed to imply a date. If it is derived from the dynasty of the Tsin which came to the throne in the year 246 B. C., then no work in which "China" occurs as the name of the country, could be older than the third century B. C. I confess that I feel very unwilling to give up this view, and the fact that the name of China occurs in the so-called Code of Manu and in the Mahábhárata, so far from invalidating the date of the name, would only tend to confirm the modern origin now assigned to these works by all critical Sanskrit scholars. The difficulty is that "erez Siním" occurs in Isaiah xlix. 12, and that the passage in which it occurs is considered by unprejudiced scholars as beyond any reasonable doubt more ancient than the third century B. C. It has been pointed out therefore, that the dynasty of the

* Foe Koue Ki, p. 14.

Tsin, before its accession to the imperial throne, had been reigning for 600 years in the province of Tsin (now Shensi), in that part of China which was the most likely to be first visited by travellers either from India or from Babylon. This would entail the loss of a most useful date, but it would help on the other hand to establish the possibility of Chinese astronomy being carried to Babylon, or Babylonian astronomy to China, at an early period, at least at the time when the second half of Isaiah was written *.

Leaving the problem, if problem it can be called, as to the coincidences between certain of the Chinese Sieu and certain of the Hindu Tárás, to be settled by scholars and astronomers who take an interest in the medieval history of India and China, we now approach a second question, namely, whether it is possible to identify the Chinese Sieu with the Hindu Nakshatras or twenty-seven lunar mansions. Bentley declared decidedly that such an attempt was useless. "With respect to the lunar mansions of the Chinese," he writes, "they differ entirely from those of the Hindus, who invariably make theirs to contain 13° 20′ each on the ecliptic; whereas the Chinese have theirs of various extents, from upwards of 30° to a few minutes, and marked by a star at the beginning of each, which makes them totally differ from the Hindu." With the more accurate knowledge of the Sieu, which we owe to Biot, the difference between the two has become still greater, and instead of wasting any more time on attempts to compare the two, and trace them back to some common origin, we have only to describe the original character of the Nakshatras, in order to show how from beginning to end they differ from the Chinese Sieu.

First then, the twenty-seven Nakshatras were suggested by the moon's passage. But though suggested by it, they were by no means confined to the one object of determining the moon's position in the heavens. Nothing was more natural for the sake of counting days, months, and seasons, than to observe the twenty-seven places which the moon occupied in her passage from any point of the sky back to the same point. It was far easier than to determine the sun's position either from day to day, or from month to month, for the stars being hardly visible at the rising and setting of the sun, the idea of the sun's conjunction with certain stars could not suggest itself to a listless observer †. The moon progressing from night to night, and coming successively in contact with certain

* Cf. Gesenius, ed. Dietrich, s. v. sînîm.

† Thus it is said in the Taitt. Br. I. 5, 2, 1: "Let him determine the Nakshatra about dawn; for when the sun rises, one cannot see the Nakshatra."

stars, was like the finger of a clock moving round a circle and coming in contact with one figure after another. Nor would the portion of about one-third of a lunation in addition to the twenty-seven from new moon to new moon, create much confusion in the minds of the rough and ready reckoners of those early times. All they were concerned with were the twenty-seven celestial stations which, after being once traced out by the moon, were fixed like so many mile stones for determining the course of all the celestial travellers that could be of any interest for signs, and for seasons, and for days, and years. Any circle divided into twenty-seven sections, or any twenty-seven poles planted in a circle at equal distances round a house, would answer the purpose of a primitive observatory. All that was wanted to be known was between which pair of poles the moon or the sun were visible at their rising or setting, the observer occupying the same central position on every day. Our notions of astronomy cannot be too crude and imperfect if we wish to understand the first beginnings in the reckoning of days, and seasons, and years, and I doubt whether a profound knowledge of modern astronomy is not more of an impediment than help to the historian of the early days of astronomical discovery. We cannot expect in those days more than what a shepherd would know at present of the sun, and moon, and stars, and seasons. We cannot expect any observation of heavenly phenomena unless they had some bearing on the practical wants of primitive society, and if we meet with any records of these we must not expect them in that scientific form in which they are said to have been recorded in China, but rather in the forms of mythes and legends, the only language possible in those days of intellectual awakening. Thus we find the earliest allusion to the connection between the moon and the twenty-seven Nakshatras, in a legend preserved in several of the Bráhmaṇas. We read in the Káṭhaka, ii. 3 *:

" Prajápati gave his daughters, the Nakshatras, to King Soma (the moon). He dwelt with Rohiṇí. Those who were not visited by him, went back; (therefore does a wife, if she is not visited, go back.) He followed them, he asked for them again. He (Prajápati) did not give them back. He said, Dwell equally with all, then will I give them back. He dwelt with Rohiṇí only. Therefore consumption seized him upon this falsehood. (The King Soma is the moon, and as consumption seized the King, this is the origin of the so-called Royal Consumption.) He withered like grass. He prayed to Prajápati. He said,

* Weber, Ind. Stud. III. p. 467.

Dwell equally with all, then will I deliver thee of this. Therefore does the moon dwell equally with all the Nakshatras."

It is unfortunate that the number of the daughters of Prajápati is not given in this passage, but it is nevertheless important as establishing the fact on which I insisted, namely, that the Nakshatras represented originally a division of the heavens into so many equal parts, and that this division was suggested by the course of the moon.

In another passage where the same legend is told (Taitt. Sanh. II. 3, 5, 1) the number of the daughters of Prajápati is stated as thirty-three*, which may possibly be explained by the fact that in the ancient lists six of the Nakshatras are spoken of in the dual†. In the later literature, however, in the Mahábhárata, Manu, the Vishṇu-Puráṇa, where the same or similar legends are related, the number of the daughters of Prajápati or Daksha‡ is given as twenty-seven.

But we need not depend on these legends only in order to convince ourselves of the intimate connection between the twenty-seven Nakshatras and the moon. The sidereal, or, as it is sometimes called, the periodical month, i. e. the time during which the moon makes a revolution from any Nakshatra back to the same, though it was not used by later writers for astronomical or historical purposes, is nevertheless described by Garga and others on account of its importance for sacrificial purposes. I give the following extract from Garga which occurs in the commentary on the Jyotisha (MS. E. I. H. 1510. p. 6):

तथा च गर्गः ।
यावता त्वेव कालेन भवर्गं त्रिणवात्मकं ।
भुंक्त इंदुः स आर्क्षो मासस्तस्यार्द्धं पक्ष उच्यते ॥
यतश्चत्वारि मानानि तानि तु गर्गवाक्ये दर्शयिष्यामि ॥ तद्यथा ॥
सावनं चापि सौर्यं च चांद्रं नाक्षत्रमेव च ।
चत्वार्येतानि मानानि तैर्युगं प्रविभज्यते ॥१॥

* The Triṇava (27) and Trayastriṅśa (33) Stoma are mentioned together, Váj. Sanh. XIII. 58.

† These are 6, 11, 12, 16, 17, 21; all the rest are spoken of either in the singular or in the plural. The commentary to Taitt. Sanh. II. 3, 5 (just received in Prof. Cowell's valuable edition) explains the number by counting the Kṛittikás as seven, and the other Nakshatras each as one.

‡ See Boehtlingk-Roth, Dictionary, s. v. Daksha; Weber, Nakshatra, p. 277.

अहोरात्रात्मकं लौक्यं[1] मानं च सावनं स्मृतं।
अतश्चैतानि मानानि प्रकृतानीह[2] सावनात् ॥२॥
ततः सिद्धान्यहोरात्राण्युदयाद्याप्यथार्कजाः।
त्रिंशच्चाष्टादशशतं १८३० दिनानां च युगे स्मृतं ॥३॥
मासस्त्रिंश ३० दहोरात्रः[3] पक्षोऽर्द्धं १५ सावनं स्मृतं।
अहोरात्रं लवानां तु चतुर्विंशच्छता २४०० त्मकं ॥४॥
सौर्यं सूर्याच्च संभूतं परिसर्पति भास्करे।
यावच्चुत्तरां काष्ठां स[4] गत्वा गच्छति दक्षिणां ॥५॥
कालेन सोऽब्दस्तस्यार्द्धमयनं तु त्रयोऽर्तवः[5]।
ऋतोरर्द्धं भवेन्मासं त्रिंशद्भागं दिनोऽर्कजः ॥६॥
तस्यार्द्धमर्कजः पक्षस्तस्मात्पंचदशं दिनं।
शतं लवानां षड्विंशं[6] लवाः पंचदशस्तथा ॥७॥
त्रिंशच्चाष्टादशशतं युगमार्कैर्दिनैः स्मृतं ॥८॥
वृद्धिक्षयाभ्यां संभूतं चांद्रं मानं[7] हि चंद्रतः।
लवं लवमथानेन सावनेन निशाकरः ॥९॥
क्षयं वृद्धिमवाप्नोति स चांद्रो मास उच्यते।
तस्यार्द्धं पार्वणः पक्षस्तस्मात्पंचदशी तिथिः ॥१०॥
प्रमाणेन लवानां तु द्वाविंशं शतमुच्यते।
सोमस्याष्टदशशती युगे षष्ट्यधिका स्मृता। १८६० ॥११॥
यावता त्वेव कालेन भवर्गं त्रिगुणात्मकं।
भुंक्त इंदुः स आर्क्षो मासस्तस्यार्द्धं पक्ष उच्यते ॥१२॥
आर्क्षात्पक्षात्पंचदशं नाक्षत्रं दिनमुच्यते।
प्रमाणेन लवानां तु द्वात्रिंशं शतमुच्यते ॥१३॥
नाम्ना सप्त षष्ट्युत्तरां[8] जनं चास्मात्परो लवः।
दशोत्तरे द्वे सहस्रे युगमार्क्षैर्दिनैः स्मृतं ॥१४॥

[1] लोक्यं MS. [2] प्रवृत्तानि? [3] त्राः MS. [4] स deest in MS.
[5] योऽर्तवः MS. [6] षड्विंश MS. [7] मासं MS. [8] स्यत्त MS.

" And so says Garga,

'The time in which the moon enjoys the circle of the Nakshatras, consisting of twenty-seven, that is a Nakshatra month, and its half is called a paksha.'

"For there are four measures of time, and I shall propound them in the words of Garga *, viz.:—

'The libatory (sávana), the solar, the lunar, and the sidereal (nákshatra), these are the four measures, by them the lustrum (yuga) is divided.

'The measure consisting of day and night is called the vulgar and the libatory (sávana) †; and therefore these measures do here proceed from the libatory measure.

'After it the nycthemera are fixed, and their beginnings proceed from the sun; and a lustrum is said to consist of 1830 such days.

'The month consists of thirty nycthemera, and half of a sávana (month) is called a paksha. A nycthemeron consists of 2400 lavas ‡.

'The solar computation is derived from the sun while Bháskara (the sun) travelling round goes to the south, having first gone to the northern region.

'This is a year in time, its half, the Ayana, consists of three seasons; half of a season is a month, consisting of thirty parts; the day is made by the sun.

'Half of it is a solar paksha, and a day is the fifteenth part of it; this fifteenth part (one day) consists of 2600 lavas §.

'A lustrum (or yuga) is said to consist of 1830 solar days ||.

'The lunar measure is derived from the moon by its increase and wane. When the moon step by step, every libatory day, increases and wanes that

* "Of four modes, namely, solar, lunar, sidereal, and civil time, practical use is made among men." Súrya-siddhánta XIV. 2.

† It is called sávana from the three libations or savanas, at morning, noon, and evening; it is the simplest conception of the day, extending always from sunrise to sunrise, without taking into account the different lengths of the year. Cf. Súrya-siddhánta I. 36; XIV. 18: udayád udayam bhánoḥ sávanam tat prakírtitam, sávanáni syur etena yajnakálavidhis tu taiḥ.

‡ A lava would thus correspond to 36 seconds of our time. Wilson's Dictionary gives a lava either as the 60th part of a nimesha, or as two káshṭhás, neither of which would correspond with $\frac{1}{2400}$ of a day and night.

1 day and night = 60 ghaṭikás (náḍí) = 24 minutes.

1 ghaṭiká = 60 kalás (pala, vináḍí) = 24 seconds.

1 kalá = 60 káshṭhás = 24‴.

1 káshṭhá = 18 nimeshas.

1 nimesha = 30 tatparas.

1 tatpara = 100 truṭis.

Other divisions are given by Boehtlingk-Roth, s. v. truṭi. Prof. Weber takes चतुर्विंशमभ्यधिकं for one hundred and twenty-four.

§ There is some mistake in the MS., which will have to be corrected with the help of other MSS. The construction is that the 26th hundred of lavas is the 15th part of the paksha.

|| One line seems to be wanting.

is called a lunar month; half of it is a párvaṇa paksha, and the fifteenth part a tithi.

'This (the tithi) is said to be 2200 lavas in measure, and in the lustrum of the moon there are said to be 1860 days*.

'The time in which the moon enjoys the circle of the Nakshatras, consisting of twenty-seven, that is, a Nakshatra month, and its half is called a paksha.

'The fifteenth part of this Nakshatra paksha is called a Nakshatra day; this is said to be 3200 lavas in measure.

'A yuga is said to consist of 2010 Nakshatra days†.'"

Another account of the different computations of the year is given in the Nirnayasindhu, written by Kamalákara Bhaṭṭa, and printed at Calcutta, 1833. There it is said, that "according to Mádhava's opinion, five ways exist of calculating the year, and that there is a sávana, saura, chándra, nákshatra, and bárhaspatya year. The Bárhaspatya year is regulated by the planet Jupiter, and is known in astronomical works only. North of the Narmadá it may be used for ceremonial purposes. Hemádri says, that there are only three different years, because the two last are not employed in the Dharmaśástra (law-books). Each year consists of twelve months, and if there be intercalary months, sixty days must be considered as one month, as Vyása said, 'Sixty days are called a month by the Bádaráyaṇas.' Five Chándra or lunar years make a yuga, and each of the sixty years has its own name. The same names apply also to the Bárhaspatya years, which begin with the month of Mágha (winter solstice), while the Chándra years begin with the bright half of Chaitra (vernal equinox). At sacrifices and on other solemn occasions the Chándra or lunar year is to be used, and no other, as Ârshṭisheṇa says.

"An *Ayana* (sun's road, half year) consists of three solar seasons. There are two Ayanas, a southern and a northern one, the one beginning with *Karka* (Cancer), the other with *Makara* (Capricorn), and different sacrifices are to be performed, according to different authorities, either in the one or the other Ayana.

"A season consists of two months, but here too an intercalary month is

* अष्टादशशती must be taken as a feminine, a sum of eighteen hundred.

† The first line is not clear, and throughout the whole extract both text and translation must be considered to rest on the authority of one MS. only.

not counted by itself. A month is of two kinds, lunar or solar. The first lunar month is Chaitra in Vasanta, the first solar month begins either with Mína (Pisces) or Mesha (Aries), as Baudháyana says: 'Vasanta (spring) is in Mína and Mesha, or in Mesha and Vṛisha (Taurus).' For śrauta and smárta ceremonies the lunar seasons ought to be used, and, if this be impossible, the solar ones. There are six seasons, lunar as well as solar: Vasanta, Gríshma, Varsha, S'arad, Hemanta, and S'iśira.

"There are four kinds of months;

1. Sávana, 2. Saura, 3. Chándra, 4. Nákshatra.

1. The *sávana* month has thirty days and nights.

2. The *saura* month goes from one conjunction of the sun to the next one. The first is Vaiśákha in Mesha (Aries). Although there are two Darśas (days of new moon or conjunction) in Mesha, the first is reckoned as belonging to Mína (Pisces), and goes to the solar month Chaitra.

"Some ghaṭikás before and after the entrance of the sun into a new sign are considered as sacred:

1. In Mesha 10 ghaṭikás are sacred before and after the conjunction.
2. In Vṛisha 16 . . . . before the conjunction.
3. In Mithuna 16 . . . . after the conjunction.
4. In Karka 30 . . . . before the conjunction (ayanam dakshiṇam).
5. In Sinha 16 . . . . before the conjunction.
6. In Kanyá 16 . . . . after the conjunction.
7. In Tulá 10 . . . . before and after the conjunction.
8. In Vṛiśchika (Annakí) 16 . . before the conjunction.
9. In Dhanus 16 . . . . after the conjunction.
10. In Makara (Jhasha) 24 ghaṭikás are sacred after the conj. (ayanam udak).
    (This is according to Hemádri's opinion. Mádhava considers 20 ghaṭikás as sacred after the conjunction.)
11. In Kumbha 16 ghaṭikás are sacred before the conjunction.
12. In Mína 16 . . . . after the conjunction.

The equinoxes fall in Mesha and Tulá.

The solstices in Karka and Makara.

3. The *chándra* month consists of two pakshas (halves of the moon). This lunar month either begins with S'ukla (the bright half) and ends with Amá (new moon), or it begins with Kṛishṇa (the dark half) and ends with full

moon. South of the Vindhya they begin the month with the moon's increase, but north of it either with its increase or with its decrease, though the former is the more usual. The first chándra month is Chaitra.

4. The *nákshatra* month consists of one passage of the moon through all the Nakshatras *.

"A Bráhmaṇa ends his month with the new moon (Amávásya), a Kshatriya with the sun's entrance (Sankránti) into a new sign, a Vaiśya with full moon. Garga says: 'The *saura* month is to be used at marriages &c., the *sávana* month at sacrifices, the *chándra* month at annual and obsequial rites. Other authorities however give different rules.'"

Having thus established the first point, that the twenty-seven Nakshatras were suggested by the periodical revolution of the moon, we proceed to consider the second, namely, that the twenty-seven Nakshatras represented so many *equal* divisions of the heavens. This was clearly indicated by the legend of Soma being ordered to dwell the same time with every one of his wives, but it is likewise implied in almost every statement in which the Nakshatras are used for chronological purposes. No one in the present day would think of employing instead of the equal segments of the zodiac, the single stars of the Greek constellations, the Lion &c., for fixing the time of the year; nor would an Indian astronomer make use for that purpose of the single stars of the Nakshatras, instead of the twenty-seven equal divisions in which these stars are scattered about. Unless the Nakshatras meant the twenty-seven equal divisions, each consisting of 13° 20′, how could it be explained that the summer solstice falls in the middle of Áślesha when the winter solstice is in the beginning of S'ravishṭhá, thus giving thirteen and a half Nakshatras to the sun's road north and exactly the same number to its road south of the equator?

The passages generally quoted to prove the inequality of the Nakshatras † are all taken from modern books, and, as far as I can understand them, they refer to the Tárás or stars, not to the Nakshatras or lunar mansions. It is

* Thus it is said in the Grammar of Páṇini (IV. 2, 3), that certain adjectives are formed from the names of the Nakshatras, to express the time connected with them, i. e. the time during which the moon is in conjunction with any one of the Nakshatras. If therefore the passage of the moon through all the Nakshatras corresponds to one nákshatra month, its passage through each of the Nakshatras would be a nákshatra ahorátra (day and night). This is said expressedly by Patanjali: कः पुनः कालो नक्षत्रेण युज्यते । अहोरात्रः ।. The day and night therefore during which the moon passes through the Nakshatra Pushya in any month would be called pausha, pausham ahar, paushí rátriḥ.

† Cf. Weber, Nakshatra, p. 309 seq.

perfectly possible that, as Hindu astronomers maintain, the moon or the sun may be in conjunction with one of the stars belonging to the Tárás, before they have entered the Nakshatra-segment to which that Tárá has given its name. Nor would this in any way disprove the equal distances of the Nakshatras, for it is only in comparison with these equidistant Nakshatras that the stars or clusters of stars could possibly be called either deficient or excessive. If the coincidences between certain Tárás and certain Sieus are so startling as they are represented to be, they may possibly find their explanation in the intercourse between the Buddhists of India and China, which dates from a period anterior to the first occurrence of the non-equidistant Tárás in Sanskrit literature.

The only passage which for a moment made me doubtful as to the equal division of the Indian Nakshatras, is that quoted by Prof. Weber from a Hebrew translation of Majríti (p. 323 seq.). Majríti (died 1007 A. D.) speaks of the lunar mansions of the Hindus: he gives their names, twenty-eight in number, and their degrees on the ecliptic. These degrees, to judge from the translation supplied by Dr. Steinschneider, vary considerably. I therefore requested Dr. Neubauer to collate the original text of Majríti, preserved in an Arabic MS. of the Bodleian Library, and I was glad to find that the apparent inequalities are due entirely to the Hebrew translation, the Arabic original allowing about 12° 51′ 26″ to each of the twenty-eight manzil *. This therefore shows again an equal division, though it does show at the same time that the Arabs, in other respects the docile pupils of the Hindus, divided the heavens into twenty-eight, instead of twenty-seven, equal segments.

Finally, as to the number of the Nakshatras, I maintain that it was originally, and that, in one sense, it always remained twenty-seven. Let us first examine Biot's view of the subject. He maintains that the number of Nakshatras was originally twenty-eight, because such was the number of the Chinese Sieu; and that † "the omission of Abhijit from the series took place because the mansion belonging to that asterism was on the point of becoming extinguished, the circle of its junction-star being brought by the precession to a coincidence with that of the junction-star of the preceding asterism about A. D. 972." Prof. Whitney has pointed out some mistakes which vitiate Biot's calculation, and

* Majríti begins: Now I shall mention the effects of the moon within the limits of their stations, as agreed upon by the Indians, &c. Dr. Steinschneider has lately supplied a more correct list of the lunar mansions from a Leyden MS. in his learned essay on "Pseudepigraphic Literature," p. 76.

† Whitney, Súrya-siddhánta, p. 208.

which would defer till several centuries later the date of coincidence of the two circles of declination. He himself, however, believes, like Biot, that Abhijit is as originally and truly a part of the system of asterisms as any other constellation in the series, which is properly composed of twenty-eight members, and not of twenty-seven. "The analogy of the other systems," he says, "and the fact that treatises like the Súrya-siddhánta, which reckon only twenty-seven divisions of the ecliptic, are yet obliged, in treating of the asterisms as constellations, to regard them as twenty-eight, are conclusive upon this point. The whole difficulty and source of discordance seem to lie in this,—how shall there, in any systematic method of division of the ecliptic, be found a place and a portion for a twenty-eighth asterism? The Khanda-kaṭaka, as cited by Albiruni, in making out, by a method which is altogether irrespective of the natural positions of the asterisms with reference to the zodiac, the accordance already referred to between their portions and the moon's daily motions, allots to Abhijit so much of the ecliptic as is equivalent to the mean motion of the moon during the part of a day by which her revolution exceeds twenty-seven days. Others allow it a share in the proper portions of the two neighbouring asterisms: thus the Muhúrta Málá, a late work, of date unknown to us, says, 'the last quarter of Uttara-Asháḍhá and the first fifteenth of Śravaṇa together constitute Abhijit: it is so to be accounted when twenty-eight asterisms are reckoned; not otherwise.' Ordinarily, however, the division of the ecliptic into twenty-seven equal portions is made, and Abhijit is simply passed by in their distribution. After the introduction of the modern method of dividing the circle into degrees and minutes, this last way of settling the difficulty would obviously receive a powerful support and an increased currency, from the fact that a division by twenty-seven gave each portion an even number of minutes, 800, while a division by twenty-eight yielded the awkward and unmanageable quotient $771\frac{3}{7}$."

In answer to Biot, who fixes the date of the suppression of Abhijit at A. D. 972, we may simply appeal to Albiruni. He wrote a book on India, and particularly on Indian astronomy, about fifty-seven years after the supposed disappearance of Abhijit. He had been in India for several years, learning Sanskrit, reading in the original the astronomical works of the Brahmans, and consulting living astronomers on the actual position of their stars, and asking their advice on any points of difficulty. Yet nothing can be more opposed to Biot's theory than the view which Albiruni takes of the Nakshatras:

"The origin of the lunar mansions," he says, "amongst the Hindus is

analogous to that of the zodiacal signs, for in reference to these mansions, the circle of the zodiac is divided into twenty-seven equal parts, each mansion comprising 13° 20′, or 800′. The planets enter and leave them, moving through them in latitude to the north and south. The principle of this division in twenty-seven parts lies in the moon's moving over the whole circumference of the heaven in 27⅓ days, which needs correction. The number of twenty-eight, admitted by the Arabs, has likewise its origin by counting from the first lunar phase in the west to the last in the east. They reckon as one of the mansions the falling Eagle (α Lyræ, Abhijit), so that they get twenty-eight, which has been the reason why some of our Arabian astronomers and almanac writers have been mistaken, asserting that the Hindus also had twenty-eight Nakshatras, and that they suppressed one which was always covered by the rays of the sun. *But this is wrong, for originally there were only twenty-seven, and one has been added afterwards.*"

Nothing can be clearer than this; nothing more in accordance with all we know from other ancient sources on the same subject. Yet Biot sees in all this nothing but a proof of Albiruni's ignorance, and remains unshaken in his belief that Abhijit was one of the old Nakshatras, and disappeared in the year 972 A.D.

In answer to Professor Whitney, who though differing from Biot's arguments, agrees nevertheless with him on the original number of the twenty-eight Nakshatras and the later suppression of Abhijit, I beg to propose the following theory. We must, from the beginning, distinguish between two things, the Nakshatras as the twenty-seven equal portions of the heavens, and the Nakshatras or Tárás as independent asterisms. We have to do the same in Greece with the zodiacal portions and the zodiacal stars, and it is well known that the Greeks for a long time admitted only eleven constellations, though they always had the twelve equal divisions of the ecliptic*. I hold then that the names given to stars

* Letronne, Journal des Savants, 1839 (p. 528): "La sphère grecque est originale; la formation en a été successive; l'idée de la division zodiacale, étrangère à sa première constitution, y a été transportée après coup; mais les figures et les noms des signes sont d'invention grecque.—Des textes existent, qui attestent l'introduction successive dans la sphère grecque de trois au moins des figures zodiacales.—Belier et Sagittaire par Cleostrate de Tenedos. (6me siècle.) Plin. II. 6.—Avant Cleostrate les asterismes n'étaient pas même au nombre de neuf; et bien qu'il n'y ait aucune preuve que l'introduction de la Balance ne soit pas due à Hipparque lui-même, il est constant que les premiers textes où l'emploi de ce signe est clairement énoncé, sont ceux de Geminus et de Varron, appartenant au milieu du 1er siècle.—On sait que Ptolémée dans son catalogue, conserve χηλαί pour la constellation (ἀστερισμός), et ζυγός pour le signe (ζώδιον et δωδεκατημόριον)."

or constellations, such as Krittiká &c., existed before the triseinadic division of the heavens became fixed; that the most interesting, though not always the most brilliant stars were selected to serve as exponents of the twenty-seven divisions; and that in this selection Abhijit was not comprised. Abhijit, however, being as its very name declares, a star of good omen, continued to be observed for sacrificial purposes, and was invoked between the twenty-sixth and twenty-seventh constellations, between Uttara-Asháḍhá and S'ravaṇa, where its real position is to be found. This is clearly shown by a popular legend, repeated in the Taittiríya-Bráhmaṇa I. 5, 2, 3 and 4: "There is a Nakshatra, Abhijit by name, above the Asháḍhás*, below S'roṇá. The gods and Asuras were fighting, the gods conquered under that Nakshatra. Because they conquered, therefore it is Abhijit, the conqueror. Him of whom one wishes that he should conquer an invincible enemy, one ought to stir up to fight under the Nakshatra Abhijit. He conquers even the invincible, and as if he (the enemy) were defeated by his own fault." When in later times the Hindus became acquainted with nations using twenty-eight instead of twenty-seven determining constellations, Abhijit would naturally be thought of in order to bring their own system in harmony with that of their neighbours, and Arabic astronomers, in particular, would naturally, though wrongly, as pointed out by Albiruni, adopt the theory, adopted by Biot, that the Hindus did not understand their own system, and that Abhijit had at all times formed an integral part of their elementary astronomy.

If with this view clearly before us we examine the earliest as well as the latest notices of the Nakshatras that can be found in the literature of the Hindus, many difficulties will disappear. The number of twenty-seven, though not to be found in the Chhandas or Mantra periods, is of frequent occurrence in the Bráhmaṇa period. Many passages containing the number of twenty-seven for the Nakshatras may be seen in Prof. Weber's Essay, and in the Dictionary of Boehtlingk and Roth. In the Taittiríya-Sanhitá IV. 4, 10, 1–3, where all the names and the presiding deities of the Nakshatras are given, Abhijit is not men-

* The commentator states that Abhijit occupies the fourth quarter of Uttarásháḍhá, and the first quarter of S'ravaṇa. There is nothing to show that Abhijit was a *new* Nakshatra; on the contrary, the Bráhmaṇa connects it with ancient legends, like all the other Nakshatras. The only reason why its position is given is because the other twenty-seven Nakshatras had been mentioned before in proper order, whereas Abhijit, not being comprised in that list, had to be referred to the two Nakshatra divisions with which it coincided.

tioned, nor is its name to be found in a similar list in the Taittiríya-Bráhmaṇa I. 5, 1. It occurs for the first time in a second list of the Nakshatras, in the Taittiríya-Bráhmaṇa III. 2, 1, 6; and it occurs there, what is important and not favourable to my theory, as the sixth asterism after Full moon. Nevertheless I cannot bring myself to believe that it here enjoys an equal rank with the other Nakshatras; or, if it does, it does so only because certain popular superstitions had attached themselves to this asterism, and because certain libations were offered to it at the same time as those destined for the twenty-seven Nakshatras. The passage from the Atharva-veda (XIX. 7, 1, 8, 1), so often quoted by Biot and others, is more decided, and certainly proves the connection of twenty-eight Nakshatras with twenty-eight days. But the Atharva-veda stands by itself, and its last books particularly contain very doubtful passages. Unsupported by the genuine literature of ancient India, nay, opposed by its almost unanimous testimony, the charms and nursery rhymes of the Atharva-veda can carry no weight.

That an attempt was made to foist in Abhijit as a Nakshatra in places where it was not intended to be, is shown in a curious way by the MSS. of the Jyotisha and its commentary. The names of the twenty-seven presiding deities are given in the Jyotisha in three S'lokas:

अग्निः प्रजापतिः सोमो रुद्रोऽदितिर्बृहस्पतिः ।
सर्पाश्च पितरश्चैव भगश्चैवार्यमापि च ॥२५॥
सविता त्वष्टाथ वायुश्चेंद्राग्नी मित्र एव च ।
इंद्रो निर्ऋतिरापो वै विश्वे देवास्तथैव च ॥२६॥
विष्णुर्वसवो वरुणोऽज एकपात्तथैव च* ।
अहिर्बुध्न्यस्तथा पूषाश्विनौ यम एव च† ॥२७॥
नक्षत्रदेवता एता‡ एताभिर्यज्ञकर्मणि ।
यजमानस्य शास्त्रज्ञैर्नाम नक्षत्रजं स्मृतं ॥२८॥

When these verses are repeated in the MS. of the commentary, Brahmá, the presiding deity of Abhijit, is inserted before Vishṇu, as pointed out by Professor Lassen, in violation of all the rules of metre.

* Comm. वरुणोऽहिर्बुध्न्यस्तथैव च.

† Comm. अज एकपात्तथा. Afterwards प्रोष्ठपदयोर्विपर्ययः पाददोषो वा ॥

‡ Comm. ह्येता.

The very name given to the Nakshatra zodiac, namely Triṇavachakra *, shows that the idea of twenty-seven was foremost in the mind of those who fixed that name †. At the time of Amara ‡ the word nakshatra was used almost synonymously with twenty-seven, and a necklace, consisting of twenty-seven pearls, was called Nakshatra-málá, Nakshatra-string. In like manner the Hemachandra-kosha, when enumerating the Nakshatras (vv. 108–115), gives only twenty-seven names, and does not include Abhijit.

Lastly, in astronomical works, the Nakshatras, if used as chronological elements, are always twenty-seven in number.

S'ákalya, the reputed author of the S'ákalya-Sanhitá, when speaking of the supposed motion of the Seven Rishis, says, "their motion is eight minutes in a year;" and again, "moving in the North into different positions, the Rishis employ 2700 years in revolving through the assemblage of asterisms §." This is possible only under the supposition that the number of asterisms is twenty-seven, not twenty-eight. For eight minutes a year would amount to 800 minutes in one hundred years. Now 800 minutes is equal to 13° 20′; this again is the twenty-seventh part of the eclipitic, and therefore the stars called the Seven Rishis would require 2700 years to pass through the twenty-seven asterisms or the whole of the ecliptic.

Varáha Mihira again, when speaking of the supposed movement of the Seven Rishis, states on the authority of Garga, that "when king Yudhishṭhira ruled the earth, the Rishis were in Maghá, and the period of the era of that king is 2526 years. The Rishis remain for a hundred years in each asterism, being connected with that particular Nakshatra to which, when it rises in the East, the line of their rising is directed ||. The same position of the Seven Rishis at the junction of the Dvápara and Kali-yuga is confirmed by quotations from Vṛiddha Garga and Káśyapa by the commentator Bhaṭṭotpala.

Now although this movement of the Seven Rishis is but imaginary, it was used for chronological purposes, and as the Pauráṇic tradition gives 1115 years as intervening between the beginning of the Kali-yuga and Nanda, the predecessor of Chandragupta (Sandrokyptos), the Bhágavat-puráṇa says quite in

* See also Taitt. Sanh. VII. 1, 2, 2.

† Cf. Boehtlingk-Roth, s. v. triṇava, where Triṇavachakra is not given.

‡ Cf. Amara-kosha, 2, 6, 2, 8. nakshatramálá syát saptavinśatimauktikaiḥ. Cf. Haláyudha II. 408.

§ Colebrooke, Miscellaneous Essays, II. 358.

|| Colebrooke, Miscellaneous Essays, II. 356.

accordance with the theory of the movement of the Seven Rishis, that "when, from Maghá, they shall reach Púrváshádhá, then will this Kali age attain its growth under Nanda and his successors;" for as eleven Nakshatras pass from Maghá to Púrváshádhá, 11 × 100 years must have passed between the beginning of the Kali age and Nanda.

A single allusion to Abhijit, as one of the chronological elements of the Brahmans, occurs in a computation proposed by Lalla, as quoted by Muniśvara in his gloss on the S'iromaṇi (Colebrooke II. 358). Lalla says: "If the number of years of the Kali age, less fourteen, be divided by 100, the quotient, as the wise declare, shows the asterisms traversed by Maríchi and the other celestial sages, beginning from the asterism of Viranchi (Brahmá)." Here Lalla is generally understood to mean the asterism Rohiṇí, which is sacred to Prajápati (or Brahmá). But Muniśvara remarks in another place, that Lalla may here intend Abhijit, which is sacred to Vidhi or Brahmá.

But even then, what is the conclusion of Muniśvara? Not that the movement begins in the Nakshatra Abhijit, as one of twenty-eight Nakshatras, placed between Uttaráshádhá and S'ravaṇa; but, on the contrary, that the movement would then begin in S'ravaṇa, of which Abhijit forms a part, and that thus the statements of Lalla and S'ákalya would be reconciled. Abhijit therefore, or Brahmá, would be simply a synonyme of S'ravaṇa or of some part of S'ravaṇa: it would not be one of twenty-eight equal divisions of the ecliptic.

I conclude with two extracts from the Súrya-siddhánta*. We read II. 64. भभोगोऽष्टशतीलिप्ताः, "the portion of an asterism is eight hundred minutes," i. e. the twenty-seventh part of the ecliptic.

We find afterwards (l. c. p. 177) from VIII. 2 to 9, the position of each asterism in the arc of the ecliptic to which it gives name, and which is styled its "portion" (bhoga), the resulting polar longitudes and the polar latitudes. The stars of which the text thus accurately defines the positions, do not, in most cases, by themselves alone, constitute the asterisms; they are only the principal members of the several groups of stars,—each, in the calculation of conjunctions (yoga) between the planets and the asterisms, representing its group, and therefore called the junction-star, yoga-tárá, of the asterism.

If therefore we find, as Professor Whitney writes, that in the former passage the ecliptic is divided into twenty-seven equal arcs, whereas in this passage we

* Súrya-siddhánta, ed. Whitney, p. 91.

are told of twenty-eight asterisms, very unequally distributed along the ecliptic, and at greatly varying distances from it, the natural conclusion is that the word nakshatra had two meanings, quite distinct from each other, as distinct in fact as Leo, when spoken of as a fixed star, and Leo, when spoken of as one of the duodecimal divisions of the sky, and that these must never be confounded.

The original meaning of Nakshatra * was of course the natural, not the scientific. It meant first, star in general, afterwards, certain stars or portions of the starry heaven. In the Rig-veda, Nakshatra does not occur in its technical sense except in one passage, which I pointed out in my History of Ancient Sanskrit Literature (p. 212) †. This passage I communicated to Biot, who referred to it on several occasions. That I was right in speaking of it as the only allusion in the Rig-veda to the Nakshatras, in the technical sense of the word, is now admitted even by those who at first were sceptical on that point. Nor should I have ventured to suggest the technical meaning of Nakshatra even in this one passage of the Rig-veda, if it had not been that it occurred in the last Maṇḍala, which contains a mixture of very ancient and very modern fragments. I agree, however, with Professor Weber, that even in this passage there is no absolute necessity for taking Nakshatra in the sense of the twenty-seven Nakshatras, the stations of the moon. The word nakshatra may even here be rendered by star. But the probabilities are in favour of the translation which I first proposed. There are several allusions in the hymn to times and seasons ‡, nay, the only two names of particular Nakshatras which have been traced in the Rig-veda occur in this very hymn, Aghâḥ for Maghâḥ, and Arjuní for Phalguní. The text, as repeated in the Atharva Sanhitá XIV.

* I say nothing of the etymology of Nakshatra, because though many have been proposed by Indian and European scholars, there is not one that carries conviction, or does not violate some of the laws of Comparative Philology. The most unobjectionable derivation is that of Yáska, who derives nakshatra from naksh, 'to come,' 'to approach.' Naksh is used of the light of the sun filling the sky, Rv. X. 3, 5; and in a similar sense it occurs IV. 43, 5, and I. 95, 10. The idea of comers or goers is certainly not a very striking one, but the ancient poets actually used charishṇu, 'going,' as an epithet of nakshatra, Rv. X. 88, 13. See Boehtlingk and Roth, s. v.

† Rv. X. 85, 2. अथो । नक्षत्राणां । एषां । उपस्थे । सोमः । आहितः, "then Soma, the moon, is placed in the lap of these Nakshatras."

‡ Verse 5. वायुः । सोमस्य । रक्षिता । समानां । मासः । आकृतिः । "Váyu is the protector of Soma, the moon (month) is the type of the years." Why Váyu is mentioned as protector of Soma is not clear. Rv. X. 21, 10, the Maruts are called nákshatraśavas, but here nakshatra seems used in the sense of 'heaven,' and the compound would mean 'of heavenly strength.'

1, 13, leaves no doubt that the two Nakshatras Maghâḥ and Phalguní are here intended.

सूर्यायाः । वहतुः । प्र । अगात् । सविता । यं । अवऽअसृजत् ।
अघासु । हन्यंते । गावः । अर्जुन्योः । परि । उह्यते ॥१३॥

"The dowry of Súryá (sun, as feminine) went forth, which Savitṛi sent off. At the Aghás the cows are killed, at the Arjunís she (the wife) is led round the fire."

This is evidently intended simply as a symbolic sanction of some ancient customs, the marriage of the sun being the type of every human marriage. That the Arjuní stars were favourable for marriage ceremonies we can see from the Taittiríya-Bráhmaṇa I. 5, 1*, where the first Phalgunís are represented as flanked by a husband and wife, the second Phalgunís by a dowry and those who carry it away from the father's house. It would be a mistake to think here of solar time, the time when the sun stands in Maghá and Phalguní being considered in India as any thing but favourable for marriage ceremonies. If the expressions here used had any direct reference to a definite system of chronology, we could only take 'at the Aghás' and 'at the Arjunís' in the sense of 'at the Aghá and Arjuní full moons,' and this would correspond with the month of Mágha or the winter solstice, the beginning of the year †, the time most auspicious for nuptial ceremonies. The killing of cows at marriage feasts may seem strange to those who are accustomed to modern Indian ideas, but the old Rishis had no scruples in killing the sacred animal. In the S'rauta-padmanábhi (MS. p. 107[b]) a Sútra is given गोपशुः कलौ निषिद्धः, "the cow as a sacrificial animal is prohibited in the Kali age," which implies that in former ages no such prohibition existed.

In conclusion, I have to say a few words on an hypothesis according to which the discovery of the twenty-seven Nakshatras was originally made at Babylon, and from thence communicated at a very early time—the date is not given—to the Indians in the South, the Chinese in the East, and sundry Semitic nations in the West. Such an hypothesis seems almost beyond the reach

* अर्यम्णः पूर्वे फल्गुनी । जाया परस्तादृषभोऽवस्तात् । भगस्योत्तरे । वहतवः परस्ताद्वहमाना अवस्तात् ॥ The commentator adds: पितृगृहात्कन्यया नीयमाना धनविशेषा वहतवः । तेषां वोढारो वहमानाः ॥

† तथा च लौगाक्षिः । माघ्याः पौर्णमास्याश्चतुरहः पुरस्तात्संवत्सराय दीक्षंते ।.

of scientific criticism, though with the progress of the deciphering of the Babylonian Inscriptions, some facts may come to light either to confirm or to refute it. At present, however, all that can be brought forward in proof of such a theory is vague and uncertain, and could not stand the test of the most forbearing criticism, much less the attacks of that uncompromising scepticism which has lately been directed against all that is called ancient Babylonian astronomy.

It is certainly striking that the Arabic name of the lunar mansions, manzil (plur. menazil), should be derived from the same root as the Mazzaloth mentioned in the Bible. In the Second Book of Kings, xxiii. 5, we read how Josiah (624 B. C.) "put down the idolatrous priests, whom the kings of Judah had ordained to burn incense in the high places in the cities of Judah, and in the places round about Jerusalem; them also that burned incense unto Baal, to the sun, and to the moon, and to the *planets*, and to all the host of heaven." The word here translated by planets is Mazzaloth. The LXX do not translate it, but render it by μαζουρὼθ, the Vulgate substitutes the zodiac; Rabbi Jona Ibn Djanáh suggests, as Dr. Neubauer informs me, the twenty-eight manzil. None of these translations rest on any tangible evidence, and all that can be said is, that the Mazzaloth *may* have been the lunar Nakshatras, but that we have no means of proving it. How dangerous it is to trust to mere plausibilities in matters involving such vast consequences, is shown by the word Mazzaroth, which occurs in Job xxxviii. 31, 32. "Canst thou bind the sweet influences of Pleiades, or loose the bands of Orion? Canst thou bring forth Mazzaroth in his season? or canst thou guide Arcturus with his sons?"

Here too Mazzaroth has been translated by the twelve signs of the zodiac; but as this is impossible, it was certainly tempting to take Mazzaroth as a dialectic variety of Mazzaloth, particularly as the expression of bringing forth the Mazzaroth in his season, seems so appropriate to the stars being, as it were, brought forth, and following each other in the succession of the seasons. Nevertheless, Professor Ewald declares such an identification as inadmissible, and is in favour of deriving the word from nêzer, 'crown,' as the name of a constellation.

The fact that the Harranians* offered sacrifices to their god Sin (moon) every twenty-seventh or twenty-eighth day, proves nothing whatever as to the existence of twenty-seven Nakshatras.

* Chwolsohn, Ssabier, II. 37, 256, 258, 295, quoted by Prof. Weber, Nakshatras, p. 316.

Lunar chronology seems everywhere to have preceded solar chronology. The Psalmist (civ. 19) sings*, "He appointed the moon for seasons: the sun knoweth his going down;" and the Vedic Rishi (X. 85, 18) when speaking of sun and moon, says, "The one (sun) shines upon all creation, the other establishing the seasons is born anew." Ibn Esra observes in his Commentary on the Pentateuch (Exodus xii. 2) that the Hebrew word for month, chodesh, can be intended for lunar months only, because it is derived from a root meaning to be new, whereas shanah, year, would imply a solar year, because it expresses the idea of annus or annulus†. It is known besides, that at Jerusalem‡ the Synedrium used to sit till two or three witnesses came to announce the first appearance of the new moon, and that the event was signalized all over the country by bonfires. And a similar custom prevailed among the Báhíkas, where, according to the Mahábhárata, an old witch sang out the new moon, beating a drum during the night, while the town of Sákala was feasting§. I could mention fifty other passages where festivals are mentioned at the beginning, the middle, or the end of each lunar month, and I believe even that the Sabbath was originally a holiday connected with a lunar chronology‖. But it serves no purpose to bring forward evidence which does not prove the point that has to be proved, and of which all that can be said is, that it is consistent with our theory.

More important are the passages where the manzil are mentioned in the Koran, X. 5, XXXVI. 39; nor can there be any doubt, after the evidence collected by Dr. Sprenger¶, that the twenty-eight lunar asterisms had been observed by the Beduins of the desert long before the time of Mohammed. Yet, after all that has been written on the subject, and I would particularly

* Humboldt, Kosmos, II. 47. (Germ. Ed.)

† Ideler, Handbuch der Chronologie, p. 489.

‡ Cf. Zeitschrift der Deutschen Morgenländischen Gesellschaft, II. p. 344. Prof. Seyffarth endeavoured to show that the Jews, before the destruction of Jerusalem, used solar months only, but his arguments are not convincing.

§ Lassen, De Pentapotamia, p. 65, verse 25.

‖ Dr. Neubauer has quoted a marginal note from the Cusari which is remarkable. It states that the hebdomadal chronology is found nowhere except where the Jews have introduced it: "J'ai trouvé une idée dans le livre de Salem ben Rou'heïm; il fait observer que nous ne trouvons pas de nations qui connaissent le sabbat (c'est-à-dire qui sachent le déterminer par le calcul), à moins qu'elles n'aient une notion de la Torah; par conséquent elles ont emprunté ce jour de repos aux Israélites; mais celles qui connaissent point la Torah, comme les Indiens et les Persans, &c., ne connaissent que les jours des mois d'après le calcul et d'après la tradition; mais elles ignorent la semaine sabbatique. Ces paroles sont citées au nom de Fayoumi." Journal Asiatique, Déc. 1861, p. 462.

¶ Zeitschrift der D. M. G. XIII. 160–165. Dr. Sprenger's remarks on page 161 are very important, and confirm the view which I have taken of primitive lunar astronomy.

call attention to Prof. Weber's careful reasonings on p. 320, I still hold to Colebrooke's view, who derives the Arabic manzil, at least in their scientific form, from an Indian source. Whatever view we may take on this point, the fact that Mohammed knew the twenty-eight lunar mansions, and that they were known to the Arabs before his time, could under no circumstances be used as an argument to show that they existed at Babylon in the twelfth century before our era, which is the point that would have to be established. The passage in the Bundehesh in which the twenty-eight divisions occur, is no more pertinent to the establishment of the Babylonian theory than the list of Coptic names*, neither of them going back beyond the time of Mohammed. Why, finally, the latitude † to be discovered from the difference between the longest and shortest days which, according to the Jyotisha, amounted to six muhúrtas, or 288 minutes, should prove the Babylonian origin of Indian astronomy, I am at a loss to understand. Exact observations on such a point are out of the question in the absence of any exact time-pieces; a large margin therefore must be left in drawing any conclusions as to the latitude of the place in which such an observation could have been made. But the rivers of the Penjáb are in about the same latitude as the rivers of Mesopotamia; the observation in its crudest form could have been made in the Indian Penjáb quite as well as in the Babylonian Doáb; the whole argument therefore dwindles into nothing at the first touch of criticism. In spite of all, however, I am quite prepared to take into serious consideration the Babylonian origin of Indian, nay, even of Chinese astronomy, whenever the decipherers of the Cuneiform inscriptions shall have supplied us with evidence that deserves to be considered. No hypothesis, however repugnant to received notions, should on that ground be treated with contempt; but it would certainly be wiser to let certain questions remain in abeyance on which no new evidence has been forthcoming since they were last handled by sound and sober scholars.

I have thus, I believe, established what I wished to establish, namely, that the Nakshatras owed their origin and their successive growth to the Indian mind; that Nakshatra, meaning originally stars in general, was fixed upon as the word to be used, κατ' ἐξοχήν, of the twenty-seven equal divisions of the starry sky, marked out by the periodical course of the moon; that they always

* Weber, Nakshatras, pp. 326, 330.

† Weber, Nakshatras, pp. 362, 400. A difference of 4 h. 48 m. between the longest and the shortest days would really correspond to lat. 35° 24'.

retained their original number and character when used for chronological purposes; but that in later times certain stars, twenty-eight in number, and vaguely corresponding with the twenty-seven ancient Nakshatras, were selected for the purpose chiefly of fixing the movements of the planets, but likewise for other astronomical and astrological purposes. How it came to pass that some of these Tárás and Yoga-tárás coincided with the Sieu of the Chinese, is a problem which will probably be solved when the history of Chinese literature has passed through the same critical ordeal which has destroyed so many illusions in Greece, Rome, and India. But, whatever that solution may be, it will never affect the springheads of the thought, of the language, and of the poetry of India, which rise from depths inaccessible to foreign tributaries, and whose earliest course we may follow step by step in the literature of the Brahmans with greater accuracy than is the case in the early history of any other nation.

The two points of which I have here treated at some length, namely, the value of the astronomical dates, and the origin of the Nakshatras, are by no means the only points on which objections have been raised tending to invalidate the views which I expressed in my History of Ancient Sanskrit Literature; but they are the most important, and they alone involved consequences compromising the antiquity and originality of the Rig-veda. If the astronomical data on which conclusions as to the age of the Veda have been built implied all they were represented to imply, the earliest periods of Vedic poetry would have to be rearranged. If it could be proved that China had exercised an influence on India, previous to the establishment of the Nakshatras, one of the principal charms of Vedic literature, its native originality, would be lost.

As to minor objections that have been started against some of the conclusions arrived at in my History of Sanskrit Literature, they must wait till more evidence has been brought forward which may tend either to modify or to confirm them. Many of these objections were not new to me, and had been carefully weighed before I wrote; others were groundless, and must have arisen either from want of clearness in the writer, or want of attention on the part of the reader. Thus when I maintained that, previous to Páṇini, no terms occurred which implied the existence of a written literature, of books, paper, pen or ink, I was perfectly aware that káṇḍa was used in ancient works in the sense of a division of a literary composition, for instance,

in the Taittiríya-Sanhitá, and in the S'atapatha-Bráhmaṇa. In fact I had mentioned káṇḍas, káṇḍikás, káṇḍanukramaṇís, &c., very frequently in my History. But how these words could prove the existence of books, i. e. of written books made of paper, I cannot see. Káṇḍa means a section, a division, whether of a tree or of any thing else; it is almost synonymous with parvan and parichchheda. As I had shown that even such a word as grantha did not necessarily imply a written book, I thought I might safely pass by such terms as káṇḍa, parvan, or parichchheda. Káṇḍa never means a book, but always a section of a work, and there is no proof* as yet that books in India were originally made of "the part of the trunk of a tree whence the branches proceed, a stalk or stem." I had myself expressed some doubts whether the word paṭala, which was said to mean originally the covering or bark of a tree, and which is used in the Rik-Prátiśákhya in the sense of chapter, might not point to books made of *liber*, the bark or rind of a tree. After Prof. Weber's remarks, however, on this word, as used in the Aitareya-Bráhmaṇa † (I. 21, 22; Áśv. S. IV. 6, 7), these doubts are nearly removed, it being most likely that the original meaning of paṭala was likewise section, division.

Another instance where my meaning has been misapprehended, and where I have been refuted ‡ for opinions which I never held, occurred with regard to the dates of Yáska and Páṇini. Because I said that on certain points Yáska holds more advanced views than Kátyáyana, it is argued that I *must* place Yáska after Kátyáyana and after Páṇini. I see how the wording of one sentence in my book could have given rise to such a misunderstanding, but no attentive reader could have failed to see that I place Yáska before Kátyáyana, before Páṇini, nay, even before S'aunaka. I believe I was the first to point out that Yáska, not Vaiyáska, was actually quoted in the Rik-Prátiśákhya, and as I still hold that this Prátiśákhya was anterior to Páṇini, I could not have placed Yáska after Páṇini.

It would be impossible to answer all objections of this kind, particularly

* This view that káṇḍa meant a book was advanced by Professor Theodore Goldstücker, in a most learned and painstaking review of my History of Ancient Sanskrit Literature, which precedes his valuable facsimile of the Mánava-kalpa-sútra. Some objections of the same scholar are answered in the next pages; others would require a fuller examination than was compatible with the limits of this preface.

† The commentator says, paṭalaśabdaḥ samúhavâchí; he also explains it by bhágaḥ.

‡ Neither púrvapaksha nor uttarapaksha could be correctly rendered by 'refutation,' in the sense in which that word is used by English writers.

when they are of a personal rather than a scientific character. Why I write uṇádi instead of uṇṇádi would seem to be a matter of very small importance. That I know the rule of Páṇini VIII. 3, 32, I have proved, I should think, in more than a thousand passages of my edition of the Rig-veda. But the phonetic rules are not applicable in their full strictness to the technical terms used by grammarians. Thus अच् means all vowels; gen. अचः (Páṇ. I. 1, 57). Whenever च् becomes final, it ought to be changed into a guttural. Páṇini does not so change it (I. 1, 10; 3, 2), nor have I ever met with the form अगादि or अगंत, which would be analogous to उण्णादि, but only with अजादि and अजंत, in apparent violation of Páṇini's own rules. The same applies to तिङंत, which as a compound is generally spelt with one ङ, whereas, if it occurs by itself, followed by a vowel, the final ङ is doubled. Thus I have always printed तिङ्ङतिङः, but तिङंत. The eighth class of verbs is commonly called तनादि *, of which there is the derivation तानादिकः (Rv. Bh. I. 138, 2), both written with a single *n*. The fact is that in the real Sanskrit there is not a single instance † where in a compound the first pada ends in a nasal, which nasal is doubled; and hence there was no analogy to be followed in such artificial words as उणादि. Besides there is a natural reluctance to apply the rules of Sandhi to technical terms, the very meaning of which might sometimes be completely changed if the changes of Sandhi were observed. Taking all this into account, and being unable by the help of MSS. to satisfy myself as to whether Páṇini's Sútras gave उणादि or उण्णादि (the editions vary), I determined to retain the usual form, and I was strengthened in my determination by the fact that in metrical works too उणादि is used with the first syllable short ‡.

With regard to one of the most important questions which have of late occupied Sanskrit scholars, namely, the Introduction of Writing, some new evidence, which deserves careful attention, has been brought to light by several of my critics, Professor Boehtlingk, Benfey, Whitney, Goldstücker§, and Westergaard. Not

* The Calcutta edition has तनादि (P. II. 4, 79), which Boehtlingk alters to तन्नादि. Westergaard retains तनादि.

† The only instance which has been brought forward, vṛishaṇaśva, is an exception to the rule, 'exceptio probat regulam.'

‡ Svaramanjarí (MS. E. I. H. 98, p. 50ᵃ, l. 1):

संज्ञासु धातुरूपाणि प्रत्ययाश्च ततः परे ।
कार्याद्विद्यादनुबन्धमेतच्छास्त्रमुणादिषु ॥

§ A few points which can be settled without entering into details may here be touched upon in a note.

1. When I said that writing was not known *before* Páṇini, I meant to imply that it became known in India about his time, but that the literature known to him, which had accumulated before his time, was oral only. I thus tried to account both for the absence of any allusion to written language

one of the facts, however, on which I based my argument, has been invalidated; on the contrary, the evidence has been strengthened, particularly by Professor

in his grammatical terminology, and for the appearance of grammatical terms implying a written language (vindu &c.) in later grammarians.

2. Lipikara, which I myself pointed out as occurring in Páṇini, is never used for writer, still less for author; it means a man who makes lipis, i. e. public inscriptions. See Westergaard, Abhandlungen, p. 33.

3. With regard to the meaning of Yávanání lipi, a wide field is open to conjecture, because we have no means of exact knowledge. The two points, however, which I maintained, have never been shaken; namely, 1. that if Yávanání lipi means the Greek writing, it does not prove that Páṇini was later than Alexander, because the Greek alphabet might well have been known in India before Alexander's conquest. This has been confirmed by Westergaard, Abhandlungen, p. 81; 2. that Yávanání lipi is most likely that variety of the Semitic alphabet which, previous to Alexander, and previous to Páṇini, became the type of the Indian alphabet. (Hist. of A. S. L. p. 521.) The numerous changes of opinion of other scholars on this subject may be seen in the "Indische Studien," V. p. 8. Professor Weber does not yet seem to be aware that his efforts to prove that Yavana *may* mean Greek were not necessary. The important point was to prove that Yavana need not always mean Greek. This point was proved by Professor Lassen. But Professor Lassen, as well as most Sanskrit scholars, was fully aware that Yavana may mean Greek, before Professor Weber informed him of this fact. To determine *where* Yavana means Greek, and *where* it means Semitic nations, or even nations of black complexion, kálayavana, this is, and has been for some time, the real problem for Sanskrit scholars.

4. Ever since I have quoted Páṇini for historical purposes, I have tried to distinguish between text and commentary, but as I have never based historical conclusions on words occurring in the commentary only, I have not distinguished between Patanjali, Káśiká, &c. Professor Goldstücker deserves great credit for having pointed out the necessity of such a distinction where the intellectual horizon of Patanjali has to be fixed. When I write "*in* Páṇini," I mean the grammar such as we have it; when I say "*by* Páṇini," I mean the man, the author of the Sútras. Professor Goldstücker is right about Páṇ. IV. 3, 108; I am glad, however, to find that I do not stand alone in my opinion of the traditional character of the udáharaṇas and pratyudáharaṇas. (See Westergaard, Abhandlungen, p. 66; and Prof. G.'s very pertinent remarks, p. 24, l. 21.) In other instances where Professor Goldstücker has suspected me of want of accuracy in quoting Páṇini, he will find that there is a Cf. added to my quotations. Wherever this is the case, I wish the reader to compare Páṇini, but give him to understand that Páṇini, the author of the Sútras, does not himself use the word in question. Thus, on page 369, the only quotation from Páṇini with which Prof. G. finds fault, is marked with Cf. The same applies to p. 361, where I refer to Páṇ. IV. 3, 101, and IV. 2, 64, in confirmation of the name by which Páṇini's own work was familiarly known in later times. Here too Cf. is added. Thus again, Páṇ. IV. 3, 108, is marked by Cf.; and the same caution is added to Páṇ. IV. 2, 66 (p. 362), to Páṇ. IV. 3, 102 (p. 371). The names mentioned on page 369 I did not intend to restrict to Páṇini.

5. The fact that Sútra in the singular means a complete work, confirms the opinion which I expressed, that it meant a string of rules, before it meant a single rule. The German "Band" does not mean a book in general, but a volume, originally a bound volume. The word was used in that sense since the middle of the eighteenth century (see Grimm, s. v.); and grammarians distinguish between der Band, die Bände, 'volume,' and das Band, die Bänder, 'string,' 'sútra.'

6. The Sútra which Kaiyyaṭa marks as not composed by Páṇini is IV. 3, 132, not IV. 3, 116. Sútra IV. 3, 116, is merely marked as not explained in the commentary. See IV. 3, 106, ityádíni chaturdaśa sútráṇi bháshye tu na vyákhyátáni. To

Westergaard. The conclusion which I draw from these facts, namely, that writing was never used for literary purposes in India before the time of Páṇini, is certainly startling, and I have never disguised this. But I confess that the explanations which have been proposed by some of my critics, in order to save the character of an ancient written literature in India, seem to me too artificial, and based on historical theories rather than on historical facts.

I ought perhaps to add a few words on the delay which has occurred in the

this fact, that certain Sútras are not explained in the Mahábháshya, I attach little importance, and quite agree with Professor Goldstücker's remarks. To any candid mind this subject is disposed of by Professor Aufrecht's remarks, Catalogus Bodl., p. 160.

7. The passage from the Mahábhárata (S'ántip. v. 11339–11342) can only be understood of the weight of memory. No one would suspect Yudhishṭhira or any body else of being intent on carrying about a book; or if he felt the weight at all uncomfortable, he might easily debarrass himself of it. The weight of the Veda (vedabhára) is spoken of in the Vasishṭha-smṛiti (History of Anc. Sansk. Lit. p. 55), where there can be no idea of heavy folios.

8. If varṇa means a modified sound, there ought to be, as Prof. G. says, something of which the varṇas are modifications. This is perfectly true. In the Rik-Prátiśákhya, XIII. 4, we read, "the breath being one, assumes in reality, as it becomes varṇa or letter, many sounds." As far as I understand Prof. G.'s further discussions on varṇa and kára, they seem to prove to me simply this, that Páṇini never uses kára, and that he uses varṇa of vowels only. In Sútra VII. 4, 53, I divide yívarṇayoḥ into y (yakára) and ívarṇa.

9. The expressions úrdhva, udaya, &c., apply to memory even better than to books. Books might be turned topsyturvy, but in the memory the beginning of a book must always be bottommost.

10. Though I have never denied that Páṇini may have been one of the first Brahmans acquainted with the art of writing, I did not think that this could be proved by the employment of accents in his Sútras. The Svarita, which was intended to show that a rule extended its influence over certain other rules, was actually pronounced, nor could a more convenient method have been imagined for distinguishing the head-words or head-rules than the prolonged intonation of the Svarita. It is nowhere said that these Svaritas were not pronounced, but only that they were not part and parcel of the rule (na tu prayogasamaváyi, lit. 'they do not enter into the effect produced by the rule').

11. As I always distinguish between the existence of an alphabet and its employment for literary purposes, I should be quite willing to admit that the shepherds at the time of Páṇini marked their cattle with letters. The Greeks knew the alphabet, and used it for commercial purposes, for inscriptions, for public registers long before they dreamt of reducing their poems to writing. (See this point well argued by Mr. Grote in answer to the late Colonel Mure, Appendix I. and II. annexed to the third edition of Grote's History of Greece.) Numerical figures, totems, &c., are known to American tribes who have no alphabet. But I must confess that Páṇ. VI. 3, 115, does not seem to prove to me convincingly the custom of using either letters or figures for branding cattle.

12. On the use of dṛiś in the sense of perceiving in general, see Boehtlingk-Roth, s. v. darś. The expression "na driśyate" is synonymous with "na vidyate," "násti." In grammar, adarśanam is explained by aprayoga I, 2, 55; and prayoga, according to Prof. G., would mean pronunciation. See also the passage quoted from Yájnavalkya III. 191, and Rig-veda-bháshya, vol. I. p. 30.

उत त्वः पश्यन्न ददर्श वाचमुत त्वः शृण्वन्न शृणोत्येनां,

and the commentary,

एकः पुरुषः पाठमात्रपर्यवसितो वेदरूपां वाचं पश्यन्नपि न सम्यक् पश्यति ॥

publication of this volume of the Rig-veda. For a time it was doubtful whether the funds necessary for the completion of the Rig-veda would be provided. This caused uncertainty and delay. When I resumed my work, my time was no longer my own, and there were more urgent occupations which left me but scant leisure for the prosecution of my Sanskrit studies. Had I been allowed to devote, I do not say the whole, but at least one half of my time to the study of Sanskrit and the carrying on of my edition of the Rig-veda, the present volume no doubt would have been published long ago. Or, if I had been satisfied with printing the commentary of Sáyaṇa such as it is given in the MSS. at our disposal, without attempting to verify the numerous quotations, to authenticate scattered allusions, to correct evident blunders of the copyists, and to supply omissions, as far as possible, from other sources, my task would have been a very easy one, and would have required far less of my time. But though a rapid reprint of a few MSS. has its advantages, and though I by no means share in the sweeping condemnation of the manner in which the text and commentary of another Veda have of late been edited, I feel that I should have ill requited the confidence of those who entrusted me with the *editio princeps* of the Rig-veda and of its commentary by Sáyaṇa, if I had not done my best to make it as perfect as it could be made in the present state of Sanskrit scholarship, and with the materials now available. How many imperfections there remain in spite of my best endeavours, no one can feel more than myself. Though greater familiarity with the style of Sáyaṇa has enabled me in the later books to remove the blunders of the copyists with more readiness and certainty than at the beginning, yet the MSS. of the later Ashṭakas are much inferior to those of the first, and the number of passages hopelessly corrupt and imperfect is constantly increasing. The few Various Readings which I have printed give a very imperfect idea of the battles which an editor of Sáyaṇa has to fight against the perverseness and carelessness of the scribes. Where the right reading could be restored with perfect certainty, little or nothing has been said in the Various Readings; but there is many a short line in these notes which represents the results of hours, nay, of days and weeks of hard work. Nor was one single passage surrendered as hopeless before every thing had been tried to render it correct.

I have stated on former occasions how much I owed to the assistance of my learned friend Professor Aufrecht, and I am glad to say that in the present

volume also I have to a considerable extent had the benefit of his cooperation. Though I regret his departure from Oxford, nothing could have been more beneficial to the interests of sound Sanskrit scholarship in this country than his appointment to the Chair of Sanskrit at Edinburgh, lately founded by Mr. J. Muir, D.C.L., the munificent patron of Sanskrit philology. Professor Aufrecht's transliteration of the text of the Rig-veda in Roman letters, now in course of publication, will be welcome to all students of Sanskrit. I look forward with confidence to many valuable contributions from his pen towards the elucidation of the Vedic language, Vedic mythology, and Vedic religion.

Another friend whose name I always had to mention in these pages with admiration and gratitude, H. H. Wilson, has not lived to see the completion of a work which owed so much to him. Without his strong recommendation it would have been impossible to secure the patronage of the Court of Directors of the late East-India Company, and afterwards of the Secretary of State for India; and some of the most valuable MSS. on which this edition is based, were procured through his influence. How deep an interest he took in this work he proved by undertaking the ungrateful task of preparing an English translation, a task which on other occasions "he intentionally left to younger and more enterprising study*." Wilson had lived through almost the whole history of Sanskrit scholarship, and had taken part in nearly every important work that marked an epoch in the study of Indian literature, history, and religion. Every one of his own works represents a new conquest. He never followed, he was always first; and though he was sometimes blamed for want of accuracy, he might well appeal to the rough work which he had to do, while others followed in the paths which he had opened and smoothed. Where any useful work was to be done, where a dictionary had to be compiled, manuscripts to be catalogued, coins and inscriptions to be deciphered, where new texts had to be edited, new works to be translated, Wilson was always ready to undertake the task which no one else was willing or able to undertake, and he never undertook any thing without finishing it with unflinching perseverance. His was not the scholarship of a Colebrooke, a Burnouf, or a Lassen; but if we look at the works which he left behind, we shall see how much we owe to him, and how much we have lost in him. Though the scorn with which he spoke of those who had never ventured in translation beyond works that had been previously translated by

* See the Preface to his edition of the Daśa-kumára-charita, p. 31.

English scholars, and who were not even familiar with the native grammarians*, provoked at the time angry rejoinders from Continental students, he lived long enough to see himself regarded as the revered Nestor by all who belong to the small but brave army of bonâ fide students of Sanskrit; and his memory will long be cherished in India as well as in Europe, as that of a real benefactor to India and to Indian literature.

I am glad to be able to announce that the translation of the Rig-veda which Wilson had undertaken, will not remain incomplete. He worked at it till nearly the last moments of his life, and Professor Ballantyne, his worthy successor in the Library of the India Office, has undertaken the task of editing his MS. What I think of Wilson's translation I have fully stated on various occasions, and particularly in the Preface to the third volume of this work. I consider a literal translation of the Veda, in strict adherence to the explanation of Sáyaṇa, as highly valuable and interesting, and I hope that that principle will be rigorously observed by the editor of the remaining portion of this translation. But though I regret that the opinions which I expressed on this subject were not approved by Professor Wilson, I cannot but repeat my firm conviction that if we may learn from Sáyaṇa how, after a lapse of thirty centuries, the ancient poems of the Rishis had been misunderstood by Indian theologians and philosophers, we must proceed in quite a different manner in order to learn how these simple hymns were originally understood by the Rishis themselves. This point has of late been so frequently discussed, that I will not here enter again upon it; but I hope within a short time to be able to lay before the public the first volume of a translation of the Rig-veda, based on those principles of interpretation on which nearly all who have worked in this new field of Sanskrit scholarship are fully agreed. A difference of opinion like this, though it may have caused pain to my departed friend and teacher, has never in the least detracted from the esteem and admiration which I shall always entertain for him. His loss I, more than any other, feel to be irreparable; but the true way to honour the memory of our departed generals is not to halt where they fell, but to advance to new conquests.

The vigour and enthusiasm with which the study both of the modern and of the ancient Sanskrit has of late been taken up, the continued activity of such

* See his "Memorandum respecting Sanskrit Literature in England."

veterans as Bopp, Lassen, Benfey, Brockhaus, Stenzler, Westergaard, the original investigations of Aufrecht, Ballantyne, Boehtlingk, Foucaux, Goldstücker, Gorresio, Hall, Kuhn, Muir, Regnier, Röer, Roth, Schiefner, Weber, Whitney, the excellent work done in India both by Europeans, such as Cowell, Griffith, and Haug, and by a most important class of independent native scholars, such as Rádhákánta Deva, Iśvarachandra Vidyáságara, Bápú Deva, Kṛishṇamohana Banerjea, Nílakantha Gore, Rajendralala Mitra, Bháu Daji; lastly, the constant succession of new students, among whom the names of Bréal, Bühler, Fausböll, Haas, Kern, Pertsch, Siegfried, deserve to be distinguished—all these hold out a hope that the study of Sanskrit will not become stagnant, or lose the position which, thanks to the genius and honest industry of Sir W. Jones, Colebrooke, and Wilson, it has gained in our Universities by the side of Greek and Latin, of Hebrew and Arabic. The work which still remains to be done, however large its proportions, will not suffer from lack of labourers. At the present moment the most pressing work is, no doubt, the Veda, and new hands are wanted both for the edition of texts, not yet published, and for the critical interpretation of the relics of the ancient poetry of the Rishis. It is impossible for one scholar, it will probably be impossible for one generation of scholars, to bring the deciphering of the hymns of the Rig-veda to a satisfactory conclusion. My own contributions can for the future be but small, and very inadequate to the great difficulties that have to be overcome. With this volume, however, the most important portion of the Rig-veda is before the public. The ninth Maṇḍala contains nothing but the Soma hymns, the tenth and last offers a mixture of ancient and modern fragments. Every scholar is now able to take his share in the elucidation of the difficult language and the still more difficult thoughts of the ancient poets of India. Much has been done already, and a most important advance towards a right understanding of the Rig-veda will have been made when the Sanskrit Dictionary of Boehtlingk and Roth, published under the auspices of the Imperial Academy of St. Petersburgh, and supported by the enlightened liberality of the Emperor of Russia, is finished. It is a work of which I feel it a duty to speak with the fullest acknowledgment of its great merits, because in this country its defects have been criticised with extreme rigour. Still further progress will be made when the Sanskrit Dictionary at which Professor Goldstücker has been working for many years is completed. But with all the light which the labours of these and

other scholars have shed on considerable portions of the Rig-veda, the dark and unintelligible passages have still a decided preponderance over those that have been made out to the satisfaction of impartial critics. Some portions of the Rig-veda, I confess, I consider as hopeless, and as likely to resist all attempts at interpretation. But there is no reason why we should despair. The Rig-veda is the most ancient book of the Aryan world. Every hymn, every verse, every word that can be deciphered in it is a gain. The sacred hymns of the Brahmans stand unparallelled in the literature of the whole world, and their preservation might well be called miraculous. We must be thankful that any authentic image of those primitive periods in the history of mankind which can now be studied in the Rig-veda, should have been handed down to us. These ancient hymns represent the lowest stratum in the growth of the human mind which can be reached anywhere by means of contemporaneous literature. And if in putting together the petrified remains of a primeval world, the geologist must often rest satisfied with fragments that tell but half of what they might have told, the historian also in gathering up the threads of the most primitive thoughts of man, must learn to make the best of rags and tatters that once formed part of the webs of poetry and religion woven by the early fathers of the human race.

MAX MÜLLER.

TENBY, October, 1862.

ADDITIONAL NOTES.

I ADD a letter of Biot's on the Nakshatras, together with some interesting notes on some parts of my essay, which I owe to the kindness of Professor W. F. Donkin, and of the Rev. R. Main, Radcliffe Observer.

Biot's letter was written about two months before his death. It was addressed to Professor Benfey at Göttingen, and printed by him in his Journal, "Orient und Occident," vol. i. p. 747. It completes the evidence, as far as Biot's views are concerned. Although we learn from it that the eminent astronomer had slightly modified his opinion as to the exclusively Chinese origin of the Indian Nakshatras, it is impossible to accept his explanation of the original character of these asterisms, which would reduce the primitive elements of Indian astronomy and chronology to mere astrological contrivances.

"C'est moi qui me trouve très-honoré, et très-heureux, de la lettre que vous venez de m'écrire. J'en suis, on ne peut plus, reconnaissant. Dans tout le cours de ma longue carrière scientifique, je n'ai jamais eu en vue que la recherche de la vérité; et je ne m'en suis cru en possession, qu'après avoir vu les résultats de mes efforts sanctionnés par l'autorité des personnes qui en étaient les juges légitimes. Votre lettre me donne cette assurance pour le précis de l'histoire de l'astronomie chinoise qui m'a occupé toute cette année. C'est ma récompense. L'opinion des gens, peu ou mal informés, favorable ou défavorable, m'est complettement indifférente. Même, dans le premier cas, je dirais volontiers, comme Phocion à ses amis, après avoir prononcé un discours qui avait été fort applaudi par le peuple d'Athènes: est ce que j'aurais dit quelque sottise! Pour les travaux de l'intelligence, comme dans les décisions politiques, je ne fais aucun cas du suffrage universel.

"L'intérêt bienveillant que vous me témoignez m'enhardit à vous soumettre une idée, qui, *si elle se trouvait justifiée par les épreuves que l'érudition pourrait lui faire subir*, terminerait, à l'amiable, toutes les controverses aujourd'hui élevées, sur la nature et l'origine des Nakshatras *primitifs* des Hindous.

"Prenons d'abord le texte réputé le plus ancien où on les voit mentionnés. Dans un passage du Rig-véda, VIII. 3, 20, cité par M. Max Müller, il est dit:

"*Soma* (la lune) *est dans le sein de ces Nakshatras.*

"Comment ces Nakshatras primitifs étaient-ils constitués? C'est la première question qu'il faut se faire.

"Or je dis que ce n'étaient pas, que ce ne pouvaient pas être, des divisions du ciel, marquées par des étoiles prises sur la route mensuelle de la Lune. En effet, le plan de l'orbe lunaire n'est pas fixe dans le ciel. Il tourne continuellement autour de l'axe de l'écliptique, en conservant, sur le plan de ce cercle céleste une inclinaison moyenne d'environ 5°, qui éprouve de très-petites variations périodiques. Ainsi dans son mouvement révolutif, qui s'accomplit en 18 ans juliens et à peu près 7 mois et demi, il contient des étoiles sans cesse différentes, entre lesquelles, par conséquent, on ne peut pas établir des intervalles fixes, qui soient toujours situés sur la route changeante que la Lune parcourt mensuellement. Les chinois, qui rapportaient généralement les positions méridiennes des astres à 28 étoiles, toujours les mêmes, auraient pu, s'ils l'avaient

voulu, considérer les intervalles équatoriaux compris entr'elles, comme autant de *Mansions* passagères, appartenantes spécialement à la Lune. Mais les plus minutieuses recherches, faites à ce sujet, dans les textes originaux et les traditions, par M. Stanislas Julien et mon fils, ne leur ont pas découvert le moindre indice de cette pensée. Les Chinois considèrent leurs 28 sieou, comme les *demeures momentanées*, du soleil, de la Lune, des Planètes, des comètes, en un mot, de tous les astres qui se meuvent parmi les étoiles, sans les attribuer particulièrement à aucun d'eux.

"Si les Nakshatras *primitifs* des Hindous, n'étaient pas des divisions stellaires prises sur la route mensuelle de la Lune on peut leur concevoir un autre mode de formation, qui aurait été bien plus simple, et plus naturel. Ce serait, qu'ils eussent désigné dans chaque lunaison, certaines époques, ou certains intervalles temporaires, auxquels on aurait attribué des influences favorables ou défavorables, comme S. Augustin nous apprend qu'on le faisait, de son tems, chez les Romains, et comme bien des gens le font encore de nos jours; n'osant pas se mettre en voyage, ou entreprendre certaines opérations agricoles, ou commencer un traitement médical, quand la Lune est en décours. Les Hindous n'auraient-ils pas, très-anciennement, sans aucune science, sans aucun échafaudage astronomique, attaché des pronostics de ce genre à chacun des 27 ou 28 jours de chaque mois, pendant lesquels la Lune nous est visible, ce qui aurait produit leurs 27 ou 28 Nakshatras? Ce ne sont là, sans doute, que des conjectures, mais si naturelles, qu'elles semblent mériter qu'on examine si les anciens textes Védiques n'en offraient pas quelque indication.

"En supposant qu'elles se trouvassent ainsi justifiées le reste s'expliquerait de soi même. Quand les Brahmes ont voulu remplacer leur astronomie primitive par une science abstraite et mathématique, comme nous la voyons établie dans le Súrya-siddhánta, les 28 sieou chinois, régulièrement définis par leurs étoiles déterminatrices, leur offraient la matière, toute préparée, d'une substitution savante à faire aux Nakshatras primitifs: et, ne voulant les employer qu'à des applications astrologiques, ils purent, sans inconvénient, les adopter pour cet usage, contrairement à leur destination originaire; de même qu'ils ont dénaturé l'emploi des excentriques et des epicycles grecs, quand ils se les sont appropriés.

"Si les choses se sont passées comme je viens de le dire, les Nakshatras primitifs des Hindous, et ceux du Súrya-siddhánta, seraient des institutions de nature et d'origine entièrement différentes, l'une indigène, l'autre étrangère; et tous les efforts d'érudition que l'on a faits, que l'on voudrait faire, pour dériver les nouveaux des anciens, seraient sans fondement, comme sans résultat. Mais dans tous les cas, ceux qui prétendraient établir cette dérivation, auraient pour obligation première, de nous faire connaître, d'après des documents positifs, en quoi les Nakshatras primitifs consistaient.

"Je m'excuserais de vous avoir entretenu, avec tant de détails, d'une simple conjecture, si la question qu'elle concerne ne m'avait paru devoir vous intéresser, comme étant un des juges les plus compétents, et les mieux préparés, pour la décider.

"En vous réiterant etc. J. B. Biot.

"P.S. Si vous pensez qu'il y aurait quelque utilité à publier cette lettre, à cause du desideratum q'on y signale, disposez en, comme vous le jugerez à propos *."

* "Für die in diesem geistvollen Brief ausgesprochene Hypothese lässt sich vielleicht schon jetzt geltend machen: 1. Vájas. Samh. IX. 7, wo sieben und zwanzig Gandharva's erwähnt werden, welche der Schol. Mahídhara gewiss mit Recht mit den Nakshatra's identificirt (man vergleiche damit Bhágav. Pur. IV. 29, 21, wo gesagt wird, dass die Gandharva's die Tage, die Gandharví's (Femin. von gandharva) die Nächte des

Note of Professor Donkin on the Vedic Calendar (page xxiv).

"The calendar at p. xxiv. professes to give the days of the month on which the solstices would fall during a cycle of five years, and also the moon's place at each solstice. It is supposed that the moon is in conjunction with the sun, and the sun in a solstice, at the beginning of the cycle; and that the same thing happens at the middle of the cycle. Hence it is easy to find the ratios which must have been assumed for the lunar months, both sidereal and synodical, to the solar year. Five solar years namely have been considered to be equal to 67 sidereal or 62 synodical months.

"According to the former of these assumptions the moon would make 6.7 sidereal revolutions in half a year; hence at the end of the half year it would be $\frac{7}{10}$ of a revolution in advance of its place at the beginning. Now $\frac{7}{10}$ of a revolution is $(\frac{7}{10} \times 27 =)$ 18.9 nakshatras. Hence if for every half year we add 18.9 nakshatras to the moon's longitude, and reject multiples of 27, we get its places as follows: (the names of the nakshatras are taken from the table in p. xxxiv.)

Time (in solar years).	Moon's longitude (in nakshatras).	Name of nakshatra in which the moon's place falls.
0	0	beginning of Śravishṭhá.
½	18.9	in Chitrá.
1	10.8	in Árdrá.
1½	2.7	in Púrva Bhádrapadá.
2	21.6	in Anurádhá.
2½	13.5	middle of Áśleshá.
3	5.4	in Aśviní.
3½	24.3	in Purva Asháḍhá.
4	16.2	in Uttara Phálguní.
4½	8.1	in Rohiṇí.
5	0	beginning of Śravishṭhá.

"This agrees exactly with the calendar, and leaves no doubt as to the way in which the moon's places were calculated. But it does not settle the ratios of the month or year to the solar day. We find it stated, however, in the extract from Garga (pp. lv, lvi), that the lustrum is said to consist of 1830 solar days; and as this lustrum is evidently the period of five years, the year must have been assumed to contain 366 days, the lunar sidereal month $27\frac{21}{67}$ days, and the synodical month $29\frac{16}{31}$ days.

"All this is clear, and agrees with the statement that a yuga (or lustrum) contains 2010 nakshatra days, that is $(\frac{2010}{30} =)$ 67 sidereal lunar months.

"But an apparent difficulty arises when we compare these results with the column in the calendar which gives the days of the month on which the solstices would fall. For since intercalations seem to be implied amounting to 60 days, the cycle would consist of 1860 days instead

Jahres sind), 2. die bekannten beiden Hymnen des Atharva-veda XIX. 7 und 8, von Regnier übersetzt in den 1859 in Journal des Savants erschienenen Artikeln (im besonderen Abdruck, p. 86, 87 Anm.). Diese Stellen sind jedoch verhältnissmässig jung. Im Rig-veda finde ich nakshatra *nur* in der Bedeutung 'Stern' (M. I. 50, 2. III. 54, 19. X. 68, 11), selbst als Bezeichnung der 'Sonne' (VII. 81, 2. X. 156, 4, und höchst wahrscheinlich auch VI. 67, 6), und ich glaube desshalb, dass *Max Müller* in der von ihm citirten Stelle (Asht. VIII. 3, 20 = M. X. 85, 2), eine Beziehung auf die Nakshatras im spätern Sinn mit Unrecht erblickt (History of Ancient Sanskrit Literature, p. 212 n.).—Anm. d. Red."

of 1830. The discrepancy will disappear, however, if we suppose the 1860 days to be, not solar days, but 'tithis,' of which 30 make a synodical month; for five years, being assumed to be equal to 62 synodical months, would contain 1860 tithis. And this also explains the statement (p. lvi) that 'in the lustrum of the moon there is said to be 1860 days,' which is unintelligible on the supposition that solar days are meant." (See the extract from Colebrooke, p. xix.)

Calculation of difference of epochs for observed precessional motion 42° 12'.30 of Regulus (from 1859), given in Archdeacon Pratt's investigation (page xxvii), by the Rev. R. Main, Radcliffe Observer.

"The general expression for the precessional motion reckoning from the year 1800, is $50''.2401\,t + 0''.0001134\,t^2$, when t is the number of years, and, reckoning from 1859, it is $50''.2545\,t + 0''.0001134\,t^2$, and this is equal to $-42°.12'.30'' = -151950''$. As a first approximation neglect t^2. Hence $50''.2545\,t = -151950''$, or $t = -3024$ years. Substituting this in t^2, we get $50.2545\,t = -152987$, or $t = -3044$ years, which is equivalent to 1186 B.C."

(Archdeacon Pratt uses for mean annual precession 50", instead of 49".899.)

Making a similar calculation for Bentley's investigation (page xxx &c.), we have for 1750, $50''.2298\,t + \cdot 0001134\,t^2 = -158460''$, whence, by exactly the same process, $t = -3177$ years, which is equivalent to 1428 B.C.

